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Are stock returns a leading indicator for real macroeconomic developments?

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Abstract: I examine whether or not returns on stock markets are a leading indicator for real macroeconomic developments in Austria, Japan and the USA. Further I deal with the concept of stock market efficiency, the question whether or not information from real and financial sectors of the economy is consistently priced on stock markets. This would not be the case if past macroeconomic developments could be used to improve forecasts of subsequent stock returns. Time series models are used to investigate the respective long-run relations between stock prices and other macroeconomic variables as well as short-term dynamics. I conclude that none of the markets under study is efficient in the above-mentioned strict sense. Only U.S. stock returns lead private consumption and, rather weakly, retail sales growth.

Keywords: Stock returns, stock market efficiency, leading indicators, macroeconomic variables, vector error correction models.

JEL classification: C32, E44, G14, G15.

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1 Introduction

Stock price indices are a major component of various leading indicators since stock prices are expected to reflect market participants' expectations of discounted future earnings (Stock and Watson, 1998, p. 17). But if stock prices lead business conditions, this does not necessarily imply a causal relation from the stock market to real economic activity. The questions which arise in this context are: 'Are changes in the stock market a source of variation in aggregate demand? Does the causation run solely in the opposite direction? Or do the levels of economic activity and of stock prices simply respond similarly to other, more basic, economic forces, with no direct causal link between the two?' (Bosworth, 1975, p. 257).

Most of the hypotheses concerning the theoretical connections of stock markets and real variables relate to investment spending (Morck et al., 1990). According to the 'active informant' hypothesis, the stock market predicts investment because stock prices convey information which is useful in making investment decisions, such as future aggregate and industry-specific demand. Secondly, high stock prices should lead to increases in investment because the cost of raising funds is low.

The relation of stock markets and consumption is also of interest. A surge in stock prices should raise consumption directly through wealth effects, and indirectly through expectations of higher wage income in the future (Boone et al., 1998).

The effects on real activity may be amplified by endogenous changes in credit-market conditions (Bernanke et al., 1994). Rising asset prices, for instance, will improve balance sheets of firms and banks, and the market value of assets owned by households will increase. Credit costs decrease and the borrowing capacity of firms and households to finance current consumption and investment should enhance (IMF, 2000).

As asset markets are responsible for more and more capital movement in comparison with the trade of goods we might expect an additional channel from stock prices to the real economy via the exchange rate. A decrease in stock prices causes a reduction in wealth of domestic investors which in turn leads to lower demand for money and lower interest rates. These lower interest rates encourage capital outflows, ceteris paribus, which in turn are the cause of currency depreciation (Granger et al., 1998). Stock prices lead exchange rates with positive correlation according to this reasoning.

As it seems to be widely accepted that asset price changes tend to lead output growth in industrial countries (see IMF, 2000), I think it is important to mention that many studies suffer from either the neglect of time series properties of the data or from analyzing only bivariate causality between a stock market and a real activity variable. I examine the empirical interrelations of stock market developments with a broad set of real as well as financial macroeconomic time series. Data are analyzed for Austria, the USA and Japan. So I obtain results for stock markets differing with regard to size, liquidity and maturity as well as regarding institutional peculiarities and recent developments. I am interested in both long-run relations and short-term dynamics and therefore apply multivariate error correction models for these purposes.

2 Previous evidence

Barro (1989) concludes that stock price changes were an important determinant for the growth of aggregate investment in the USA even when corporate profits were controlled for. For his most recent sample, however, the stock market variable is no longer statistically significant in the investment growth equation. Blanchard, Rhee and Summers (1993) find that market valuations seem to play at most a limited role in affecting investment decisions, given fundamentals.

Binswanger (1999) argues that empirical evidence for the U.S. economy suggests that there was a breakdown in the relation between returns on the stock market and future real activity in the early 1980s. He attributes this to a scarcity of profitable real investment opportunities and a large number of mergers and acquisitions which tended to shift profits from real activities to financial transactions on the stock market. Additionally, profit expectations of transnational companies are not solely related to domestic markets, but rather to the expected development of the world market. So positive expectations do not necessarily lead or stimulate domestic activity because large parts of production take place in other countries.

For Italy, Pagano et al. (1996) present evidence that capital raised by initial public offerings is often not used to finance subsequent investment and growth. Instead, the raised funds are used to purchase stakes in other companies and financial assets. Even the U.S. stock market was not extensively used for financing business activities in the last decades (see Binswanger, 1999). Additionally, stock prices need not affect the level of investment but only the way in which it is financed.

The aggregate evidence of Morck et al. (1990) is consistent with what they call the 'passive informant' view of the relations between stock prices and investment. As managers usually know more about the investment opportunities of the firm, its stock market valuation does not provide any information that would help managers in deciding about investment. Even if the stock market conveys useful predictions about the future aggregate state of the economy, also an 'active informant' view would result in stock prices not predicting investment if future fundamentals are controlled for and expectations are correct.

Bond and Cummins (2000) point to serious anomalies in the behaviour of stock prices like bubbles, fads or other psychological influences accounting for the weak relationship between stock market prices and investment for the past two decades. They claim that expected future profits still seem to be the most relevant factor for managers' investment decisions.

A conventional view among economists is that the marginal propensity to consume out of stock market wealth is between 3 and 7 % with the effect materializing over one to three years (Starr-McCluer, 1998, pp. 3 f.). Among others, Boone et al. (1998) report statistically significant stock market wealth effects on consumption for the USA using aggregate data. They also find that these effects may be confirmed for other G7 countries, but they are weaker than in the USA. Especially for the continental European countries, this may be due to smaller stockholding, a more unequal distribution of stockholding, and later financial liberalization.

Any short-run correlation between stock prices and aggregate spending, however, could also be statistical, pointing to the stock market providing passive predictions only (Poterba and Samwick, 1995, p. 296). More fundamental factors, such as economic optimism, may be responsible for changes in both stock prices and consumption.

Starr-McCluer (1998) provides survey-based U.S. micro-level information on consumer spending to disentangle the two stories. She finds that most stockholders reported no appreciable effect of stock prices on their saving or spending behaviour. One reason for this seems to be that stockholders save for retirement which prevents them from spending capital gains. Other reasons are job insecurity, and the fact that most of the increase of equity holdings took place through mutual funds and retirement accounts which are not as liquid as direct holdings. Even if large parts of the population own corporate stock either directly or indirectly, we know that capital gains and losses on such assets are highly transitory and only a small proportion are actually realized (Bosworth, 1975, p. 261). Only wealthy households with large stockholding might account for a modest aggregate wealth effect.

Poterba and Samwick (1995) find little evidence for an important positive wealth effect on consumption. They support the leading indicator hypothesis by finding that changes in stock prices have significant predictive power for future consumption spending as they signal changes in future income.

In spite of the fact that the empirical micro evidence does not succeed in underpinning household-level wealth effects, Dynan and Maki (2001) point out that there are strong theoretical arguments for such direct wealth effects. Budget constraints imply that an increase in an household's wealth must eventually raise its consumption. If this response emerges relatively quickly, it could explain a direct channel between stock prices and consumption. The above doubts could, in this sense, be interpreted as a lag of the response of consumption which is too long for the wealth effect to show up in the consumption of current equity owners. Wealth is rather passed on to future generations via larger bequests. If these lags are indeed long, an aggregate relationship between stock market wealth and consumption might nevertheless arise because of an indirect effect via consumer confidence which is supported, for example, by Otoo (1999).

Knowledge about the interrelations between stock prices and macroeconomic variables becomes more and more important also for smaller stock markets as their economic role (they are less liquid and said to be more affected by speculation and government interventions) is less understood compared to well-organized and mature markets. Recently, an increasing number of studies appeared for, above all, Asian markets (e.g. Granger et al., 1998, Kwon and Shin, 1999, Maysami and Koh, 2000).

Among the studies which utilize vector autoregressive or error correction models and establish a leading indicator role of stock prices or returns for real activity in the USA are Lee (1992) and Chopin and Zhong (2000). Italy is the only G7 country where causality of real stock returns for industrial production growth is not supported by Choi et al. (1999). Leigh (1997) observes that stock returns are Granger causal for industrial production growth in Singapore. Stock markets do not provide signals for real variables in e.g. Norway (Gjerde and Sættem, 1999 and Gjerde et al., 2001) and Korea (Kwon and Shin, 1999).

3 Methodological framework

I employ time series data and methods to analyze the empirical relations between stock prices and a broad set of real and financial macroeconomic variables. At least some of the time series will be trended and therefore nonstationary. Since most unit root tests suffer from size distortions and lack of power, I mainly explore their results to confirm that the series employed are integrated of an order lower than two.

Initially, I set up a reduced-form vector autoregression (VAR)

$$X_t = \mu + \sum_{i=1}^{p} \Theta_i \, X_{t-i} + e_t \tag{1}$$

of order p, with X being a vector of n time series. I estimate the corresponding vector error correction representation (VECM)

$$\Delta X_t = \mu + \Pi X_{t-1} + \sum_{i=1}^{p-1} \Gamma_i \, \Delta X_{t-i} + e_t, \tag{2}$$

which is equivalent to equation (1). The Γ_i's are parameter matrices and e_t is a vector of normally distributed random errors. The errors are contemporaneously correlated, so that they have a non-diagonal covariance matrix. If Π has a reduced rank there exists a decomposition $\Pi = \alpha\beta'$ with α and β being $n \times r$ matrices.

The equilibrium error $\beta' X_{t-1}$ contains information about linear combinations of the series in levels which are integrated of a lower order than these (cointegrating relations). The number of such relations has to be estimated. I look for relations which are stationary (given the series are not integrated of an order greater than one). By applying the Johansen method (Johansen, 1995) this corresponds to test the rank of Π, denoted by r, by checking how many eigenvalues of Π are significantly larger than zero. The first r columns of β then are the cointegrating vectors.[1]

A relation between variables described by a cointegrating vector can be characterized as deviations from some equilibrium relation between the series which need not exactly be fulfilled at each point in time. The dynamic paths of the variables will be related to deviations from the long-run relationships so that these will be corrected after some time. The coefficients in the matrix α measure the speed of adjustment of the considered series towards the long-run relations after a shock to the equilibrium has taken place. At least one of the variables which form a long-run relation must be responsible for the adjustment.

Standard F-tests with the null hypothesis that all lagged terms of one variable are zero in a particular equation are usually employed then to test for Granger causality, to assess whether one variable helps in improving predictions of another.[2]

[1] Differencing without testing for such cointegrating relationships before would, if those exist, result in a loss of information and in misspecification.

[2] Granger causality need not always mean 'causality' as it is commonly understood. Maddala and Kim (1998), for example, argue that a better term for Granger causality would be 'precedence'. Or we could also say that if x_t Granger causes y_t, it is a predictor or signal for y_t as the concept of Granger causality deals with short-run forecastability only.

I will use Granger causality results to examine the predictive content of stock prices for real macroeconomic developments as well as the issue of stock market efficiency. But Granger causality only refers to information from the reduced form of the model. Therefore, I will also address identification questions when presenting innovation accounting results.

4 Stock market efficiency

There is empirical evidence that at least a portion of stock returns is predictable with past information on particular macroeconomic variables (see e.g. Granger et al., 1998). This conflicts with the 'efficient market hypothesis' with respect to stock markets.

According to weak form efficiency (Campbell et al., 1997), stock prices should reflect the information contained in the historical sequence of prices. Successive changes in prices should then be independent and therefore uncorrelated and unpredictable, so that investors should not be able to devise an investment strategy on the basis of past price patterns to yield 'abnormal' profits (Riley, 1999). Stock prices should follow a random walk and stock returns should be stationary.

The semi-strong form of efficiency asserts that all information which is known to and shared by, respectively, all market participants about a company is fully reflected in prices. This implies that no one can make use of e.g. income or profit statements, announcements regarding dividend policy or any other publicly available information to yield abnormal profits (Leigh, 1997, p. 13). If prices do not move when information is revealed, then the market is efficient with respect to that information (Campbell et al., 1997, p. 22). On the macro level, past information on e.g. money supply or output should therefore not be related to current stock market valuations.

I will test whether the stock markets of Austria, Japan and the USA are efficient in this sense as well as whether or not returns on these stock markets belatedly adjust to deviations from long-term equilibria in goods and financial markets.

5 The stock markets under study

A brief characterization of the stock markets of Austria, Japan and the USA shall provide some crude indications of how stock prices are related to the respective economies. The Austrian stock market is small (measured e.g. by market capitalization in % of GDP) and the potential for real sector destabilization because of financial crises is much lower than for economies with larger stock markets (OeNB, 2001b, p. 46). The ratio of capital raised on the stock exchange via capital increases and initial public offerings relative to gross fixed capital formation in Austria was approximately 4 % for the period of 1990 to 2000, fluctuating considerably.[3]

One of the main reasons for the relatively low usage of equity issues in corporate finance in Austria is the predominance of small and medium-sized enterprises. Small businesses

[3] If we would include the amount of equity capital Austrian companies raised on foreign exchanges this share would be half a percentage point higher (OeNB, 2001b). The respective figures in 1999 were: Austria: 1.7 %, USA: 11.1 % and Japan: 7.8 %.

may be reluctant to get listed on the stock exchange because of the necessity to change the legal form of the business and much larger information and disclosure requirements. But the number of companies listed per million of inhabitants is even smaller in Germany and Italy than in Austria (Waschiczek and Fritzer, 2000).

Only a small fraction of Austrian households holds securities. As Mooslechner (1998) argues, Austrian households have little portfolio diversification. Savings deposits are dominant and behavioural patterns of households are changing only slowly in this respect. The percentage of Austrians owning equities in 2000 was around 7 % (OeNB, 2001a), the fraction of shares in total financial assets of the household sector was 4.5 % in 1999 (Waschiczek and Fritzer, 2000).

Austrian investors do not favour domestic stocks as an investment vehicle because Austrian shares are not liquid enough and price developments are poor (OeNB, 2001b). There is no so-called 'home bias' in equity investment. This represents an additional reason for presuming at best a weak causal link from Austrian stock market developments to the real sector. Since financial intermediaries are the main investors in stocks in Austria they represent the premier transmission channel to the real sector as the value of their assets partly depends on stock prices (OeNB, 2001b).

The percentage of households holding stocks in Japan was around 23 % in 1997, the share of risky assets (mainly stocks) in total financial assets around 5 %. Both fractions were larger in the past (Nakagawa and Shimizu, 2000). According to the NYSE stockownership survey 2000, 43.6 % of the adult U.S. population held shares in 1998, around 40 % of them directly. The share of equities of U.S. household assets was around 33 % at the end of the 1990s (Tracy and Schneider, 2001). So, finding evidence of a stock market wealth effect on consumption is most likely to take place for the USA.

6 Empirical Results

The main focus of this section lies on the empirical interrelations between monthly series of stock prices and real as well as financial macroeconomic variables. Complementary, also quarterly available data on investment and consumption are employed.

6.1 Results with monthly data

Eight variables enter the analysis. Domestic real activity is represented by industrial production and retail sales. The financial and international variables are the three month interest rate, the effective exchange rate, the inflation rate, an index reflecting oil price developments, a stock price index and OECD industrial production. I apply data from 1976 to 2000.[4] Retail sales may be seen as a proxy for consumption with monthly data and oil prices are included because of the great importance of oil to the world economy.

Partly ambiguous results emerge with ADF and KPSS unit root tests but none of the variables is integrated of an order greater than one. As there is no standard choice mechanism to set the number of lags to be included in the model, likelihood ratio tests

[4]The Japanese sample starts in 1979. See the appendix for a detailed description and data sources.

and information criteria were consulted as well as autocorrelation tests.[5] I chose 8 lags for the vector error correction model with Austrian data, 5 lags for the Japanese and 6 for the U.S. model.

6.1.1 Cointegration results

Cointegration analysis is based upon a model with unrestricted constants and a trend which is restricted to the cointegration space.[6] The error correction model I estimate is of the form

$$\Delta X_t = \mu_0 + \alpha(\beta' X_{t-1} + \mu_1 + \delta_1 t) + \sum_{i=1}^{p-1} \Gamma_i \, \Delta X_{t-i} + e_t. \tag{3}$$

Decisions concerning cointegration ranks are based upon Johansen's maximum eigenvalue statistic and upon visual inspection of the respective relations. I conclude that there are three stationary linear combinations of the Austrian series in levels and two between the Japanese as well as the U.S. series. The unrestricted cointegration coefficients I estimated are not shown as I want to test some hypotheses in the r-dimensional cointegration space.[7] First, I test whether one of the cointegrating vectors is a unit vector which amounts to a stationarity test of individual variables in the multivariate context.[8] Nonstationarity cannot be convincingly rejected for any of the series. Second, I also test the hypothesis that individual variables can be excluded from all the estimated cointegrating relationships. Apart from the result that the Austrian oil price series plays no role in the respective long-run relations, these exclusion tests confirm that this is not the case for stock prices in all of the countries considered here. Stock market developments appear to be systematically related to macroeconomic variables in the long run.

More specific hypotheses about the structure of the cointegration space can also be tested. I propose long-run relationships which are similar to the ones of Chopin and Zhong (2000). The corresponding restrictions are accepted for the Austrian case and the respective cointegrating relations are in Table 1. E.g. the first Austrian vector means that the linear combination 'production - 0.198 sales - 0.972 OECD production ... ' is constant and stationary. This first vector represents the international goods market relation, the second one describes a connection of domestic demand, inflation and the interest rate, and the third one proxies a yield equilibrium relation. Each vector was standardized by dividing by one of the coefficients. For the Japanese and the U.S. model the corresponding restrictions are rejected. Tests suggest that the cointegrating vectors should remain unrestricted for the Japanese data. The U.S. inflation rate seems to be trend-stationary. Ambiguous test results also lead me to not restricting coefficients of the second U.S. vector to zero.

[5] A lag length which is too short to properly approximate the true dynamics results in misspecification, long lag structures lead to a waste of degrees of freedom.

[6] If some or all of the time series display a trending pattern, one should (as it is argued by Franses, 1999) allow for a trend in the cointegrating relations. Doornik et al. (1998) suggest that adopting a model that includes a trend in the cointegration space has low cost even when the data generating process does not have one.

[7] All the corresponding test statistics and their distributions can be found in Johansen (1995).

[8] Stationary variables are allowed to enter cointegration analysis, but add an extra cointegrating vector and therefore enlarge the dimension of the cointegration space r by one.

	AUSTRIA			JAPAN		USA	
	β_1	β_2	β_3	β_1	β_2	β_1	β_2
Production	1.000	1.000		1.000	1.000		1.000
Sales	-0.198	-0.069		-0.718	-0.778		0.010
	(0.059)	(0.110)					
Stock prices			1.000	-0.051	-0.178		-0.414
OECD production	-0.972			-1.390	0.474		0.340
	(0.061)						
Oil price				0.043	-0.218		-0.163
Interest rate		-0.012	-0.163	-0.021	-0.044		0.001
		(0.003)	(0.026)				
Exchange rate	0.209		-10.862	0.288	-0.530		0.155
	(0.059)		(1.053)				
Inflation		0.017		0.066	-0.027	1.000	
		(0.003)					
Trend	-0.00034	-0.00198	-0.00007	0.001	-0.002	0.008	-0.001
	(0.00016)	(0.00019)	(0.00080)				

Table 1: Long-run relationships with monthly series (standard errors in parentheses).

Unfortunately, one cannot say which of the variables is described by such a long-run relationship. Coefficients at best can be interpreted as conditional long-run correlations. For example, one could state that the conditional long-run correlation between real industrial production and real retail sales is positive if the signs of their coefficients differ. But even if all variables were in logs, the coefficients of a cointegrating relation usually cannot be interpreted as elasticities, because a shock to one variable implies a shock to all variables in the long run and hence, in general, the coefficients do not allow a ceteris paribus interpretation (Johansen, 1995, p. 50). Nevertheless, there is an important result so far. For each country, stock prices are a relevant part of long-run equilibria between the macroeconomic variables I consider. Next, the direction of causality has to be discovered.

6.1.2 Error correction model results

The eight equations of the vector error correction model can be estimated by OLS and provide an insight into the short-run dynamics of the system. Granger causality and adjustment to deviations from long-run equilibria make up the reduced-form results which are of interest.[9]

[9] All variables are in differences as indicated. I will refer to the growth rates of the stock market indices as 'stock returns' in the following.

To assess Granger causality, the p-values of the F-test for the set of all lags of a particular variable in a corresponding equation are shown in the left part of Table 2. These enable an assessment of whether past information can be used to forecast stock returns and which information this is. Table 2 also shows the corresponding measures for the lagged stock returns in all the other equations of the system. Based on this, I will be able to conclude which economic developments are signalled by the stock market in the countries considered.

It turns out that neither stock market is efficient with respect to some information of the economy. As a first example, lagged changes in the inflation rate seem to be Granger-causally prior to stock returns in Austria as the p-value for the F-test on its lags in the Austrian stock returns equation is 0.059. Rising inflation signals reduced real returns on the Austrian stock market. Growth rates of national industrial production and retail sales also are factors which prove informative for subsequent stock returns in Austria. The delayed response to growth in industrial production is positive, the one to increasing retail sales growth is negative. An additional aspect of the inefficiency of the Austrian stock market is that it contemporaneously reacts to previous disequilibria in the long-run relation between national and OECD production. The coefficient of $\beta_1' X_{t-1}$ is strongly negatively significant (Table 3). Past information neither on real exchange and interest rates nor on stock returns themselves can be used to predict changes in the aggregate Austrian stock market valuation.

Results for Japan and the USA are clearly different from the Austrian ones. Past changes in the real exchange rate seem to be relevant for the development of Japanese stock returns. Interestingly, the effect is unidirectional as there is no Granger causality from stock returns to changes in the real Japanese exchange rate. The positive sign of the signal suggests that an appreciation of the Yen generates favourable news for the stock market via relatively low prices of imported goods in the Japanese case. Past increases in the growth rate of retail sales also signal subsequently rising stock returns in Japan. As opposed to Austria, Japanese as well as U.S. stock returns can partly be predicted by past ones as for both markets the changes in the stock market index lagged one period are highly significant for current stock returns. This is not the only factor whose past developments improve forecasts of U.S. stock returns. Coefficients of international and domestic industrial production growth rates are positively significant. Increases in the inflation rate one month before signal decreasing returns on the NYSE. Also several lags of sales growth negatively lead stock returns in the USA as as well as changes in short-run interest rates. Table 3 shows that in Japan and the USA, stock returns also adjust to deviations from long-run equilibria.

On the other hand, one would expect that stock markets have predictive content for real variables like industrial production. My results do not support this for the countries under examination which is in clear contrast to the typical view that the U.S. and the Japanese stock markets rationally signal changes in real activity and that they accurately reflect expectations of future events in current prices (Gjerde and Sættem, 1999, p. 68). One exception might be that in the equation of the Austrian industrial production some lagged stock returns prove to be significant, but negatively. I cannot say whether this characterizes the actual price formation process on the Viennese stock market or a random effect. The other exception is for the U.S., where stock returns, to some extent, give a positive signal for subsequent retail sales growth.

AUSTRIA

	Granger causality test p-values		24 months FEVD			
	Δ Stock prices equation	Δ Stock prices in equation of	FEVD of Δ Stock prices		Δ Stock prices' share in FEVD of	
Δ Oil price	0.107	0.575	10.75	(5-23)	4.83	(3-10)
Δ OECD production	0.151	0.862	31.06	(12-42)	2.00	(1-7)
Δ Exchange rate	0.604	0.445	21.42	(5-32)	3.80	(2-10)
Δ Sales	0.065	0.637	4.32	(2-12)	3.21	(2-10)
Δ Production	0.057	0.062	8.94	(6-18)	5.49	(3-12)
Δ Inflation	0.059	0.145	3.56	(1-15)	2.56	(1-8)
Δ Interest rate	0.607	0.623	4.48	(2-13)	3.02	(2-8)
Δ Stock prices	0.631		15.48	(10-25)		

JAPAN

	Granger causality test p-values		24 months FEVD			
	Δ Stock prices equation	Δ Stock prices in equation of	FEVD of Δ Stock prices		Δ Stock prices' share in FEVD of	
Δ Oil price	0.376	0.315	4.81	(2-13)	2.52	(1-9)
Δ OECD production	0.864	0.156	1.46	(1-8)	2.77	(1-9)
Δ Exchange rate	0.067	0.863	5.81	(2-15)	1.00	(0-7)
Δ Sales	0.048	0.899	7.05	(3-15)	0.58	(0-6)
Δ Production	0.489	0.635	2.68	(1-10)	1.85	(1-8)
Δ Inflation	0.848	0.670	2.08	(1-8)	1.40	(1-7)
Δ Interest rate	0.819	0.613	1.15	(1-6)	1.25	(1-7)
Δ Stock prices	0.000		74.97	(53-76)		

USA

	Granger causality test p-values		24 months FEVD			
	Δ Stock prices equation	Δ Stock prices in equation of	FEVD of Δ Stock prices		Δ Stock prices' share in FEVD of	
Δ Oil price	0.153	0.205	3.26	(2-10)	3.46	(2-9)
Δ OECD production	0.002	0.598	7.99	(4-16)	2.54	(1-8)
Δ Exchange rate	0.635	0.018	2.92	(2-11)	4.28	(2-10)
Δ Sales	0.079	0.083	3.82	(2-10)	2.83	(1-10)
Δ Production	0.078	0.466	4.32	(2-10)	1.90	(1-7)
Δ Inflation	0.010	0.008	5.74	(3-12)	3.90	(2-10)
Δ Interest rate	0.100	0.073	8.13	(4-16)	3.61	(2-10)
Δ Stock prices	0.000		63.83	(43-65)		

Table 2: Summarized results (incl. 95 % confidence intervals for FEVD percentages).

	AUSTRIA			JAPAN		USA	
	$\beta_1' X_{t-1}$	$\beta_2' X_{t-1}$	$\beta_3' X_{t-1}$	$\beta_1' X_{t-1}$	$\beta_2' X_{t-1}$	$\beta_1' X_{t-1}$	$\beta_2' X_{t-1}$
Δ Production	-0.746	-0.078	0.044	-0.083	-0.062	-0.002	-0.040
	(0.140)	(0.095)	(0.010)	(0.028)	(0.016)	(0.0009)	(0.012)
Δ Stock prices	-1.223	0.017	-0.011	0.134	0.150	-0.006	0.132
	(0.321)	(0.032)	(0.023)	(0.097)	(0.056)	(0.004)	(0.043)

Table 3: Adjustment of Δ Production and Δ Stock prices to long-run disequilibria: Coefficients of equilibrium error terms in the respective equations of the error correction models with monthly data (standard errors in parentheses).

Effects of stock price developments on industrial production could be pinned down from Table 3. Production growth of all countries reacts to deviations from equilibria which involve stock price index levels (the third relation in case of Austria, both for Japan, the second U.S. relation). Explicit inference is difficult, as I cannot, from the outset, attribute these disequilibria to changes in stock price indices.

In the USA, stock returns negatively precede changes in the inflation rate. I also conclude that increasing stock returns lead changes in the real exchange rate of the dollar positively (appreciation), but the coefficients are, at best, weakly significant.

6.1.3 Innovation accounting results

Which effect does a shock (innovation) in one variable have on a specific or all the variables in the system? This can be investigated by increasing the error term in the equation of the variable to be shocked and trace the resulting changes and effects in the system. But as the reduced-form errors are not independent from each other, I cannot distinguish between the effects of original and successive shocks. To derive error terms which are not correlated across equations I apply the Choleski decomposition to carry out an orthogonalization transformation of the reduced-form residuals. Impulse response analysis is based on the orthogonalized moving-average representation

$$\Delta X_t = \tau + \sum_{i=0}^{\infty} \phi_i \, \epsilon_{t-i}. \tag{4}$$

The coefficients of ϕ_i can be used to trace the effects of the 'structural' shocks or innovations in ϵ on the entire time paths of all variables. A second useful tool in innovation accounting results from dealing with the n-period forecast errors of the variables

$$\Delta X_{t+n} - \mathrm{E}_t[\Delta X_{t+n}] = \sum_{i=0}^{n-1} \phi_i \, \epsilon_{t+n-i}, \tag{5}$$

where $\mathrm{E}_t[\Delta X_{t+n}]$ denotes the n-period forecast of ΔX_t. Portions of the forecast error's variance can be attributed to innovations in the variables in the system. For monthly data a usual horizon for this forecast error variance decomposition (FEVD) is 24 months. As both FEVD and impulse response analysis rest on the same information, the ordering of the variables is in both cases essential.[10] The chosen ordering is based on general propositions to put internationally determined variables first and to put variables last which are not expected to influence others instantaneously. Series whose reduced-form residuals are significantly correlated should be ordered next to each other.

Differences to causality results arise because of instantaneous interrelations for which there is no room in the Granger concept of causality. I do observe some such factors. Qualifying the Granger causality results for Austria somewhat, we see that the error variance proportion for stock returns which is due to innovations in inflation rate changes is rather small (3.56 %). Large parts of the forecast error variance of changes of the stock market index are attributable to innovations in OECD production and real exchange rate growth. Shocks in domestic industrial production growth explain almost 9 % of the forecast error variance of real stock returns.

From the last columns of Table 2 we see that the share of innovations in stock returns in accounting for variation in production growth rates for the Austrian case (5.49 %) is in fact the highest for all countries considered here. Innovations in U.S. stock returns account for only 1.9 % of the forecast error variance of industrial production growth. I conclude that the information content of U.S. stock returns with respect to production prospects seems to have radically diminished in recent times as Lee (1992) reported this figure to be as large as 10.61 % with monthly U.S. data from 1947 to 1987.[11] The shares of innovations in stock return growth with the decompositions of the other variables' forecast error variances are rather low for all countries. I would have expected these figures, at least in the U.S. case, to be somewhat higher with the preceding Granger causality results in mind.

Table 2 also includes rounded 95 % confidence intervals in parentheses. Since the proportions featured by FEVD analysis are non-negative by definition, asking if innovations in one variable do not cause any of the variation in another variable is not appropriate (Runkle, 1987, p. 10). The confidence intervals are to be interpreted as reflecting the uncertainty associated with the point estimate at the horizon regarded. Impulse response graphs (see a small selection of them in Figure 1) were produced by assuming a one-time shock of one standard deviation in structural errors, and the responses are drawn as fractions of the response variables' standard deviation.

[10]The Choleski decomposition is based on the estimation of a lower-triangular $n \times n$ matrix B by use of a decomposition of the variance-covariance matrix of the reduced-form residuals. B is equivalent to the matrix of contemporaneous interrelations between the variables in a structural error correction model. As the orthogonalization procedure, rather mechanically, restricts all elements above the pricipal diagonal of B to zero, the ordering of the variables therefore implicitly states that no variable has a contemporaneous effect on the first. Only the first has such an effect on the second and only the first two on the third and so on (Enders, 1995, p. 324). Different orderings therefore yield different innovation accounting results. This approach achieves exact identification of the structural errors by premultiplying the reduced-form residuals by B.

[11]His model, however, consisted of four equations only limiting the possibility to directly compare the results.

Instability of the Austrian model is indicated as shocks do not die out and confidence bands are very wide for responses farther in the future. Nonetheless, my results are robust with respect to variations in innovation accounting horizons and variable orderings. Some larger differences emerge with an aggregation of monthly to quarterly data series. But to a great extent, these may be attributed to an implicitly differing time span covered then.

6.2 Results with quarterly data

6.2.1 Stock markets and investment

The second specification employs quarterly data and mainly should allow an examination of the empirical relations between investment growth and stock returns. For all countries, the order of the error correction model including investment, GDP, a long-term interest rate, stock prices, labour compensation and corporate profits is proposed to be three.[12] The estimated long-run relationships can be found in Table 4. These relations imply that the Austrian stock market index was found to be trend-stationary as well as the real U.S. GDP. Japanese unit labour costs are stationary around a specific level.

Again, the stock price indices cannot be excluded from the respective cointegration spaces according to appropriate tests. Table 5 shows the results of Granger causality tests for the equation of gross fixed capital formation. Stock returns are not found to signal changes in investment growth. The relevant influences are the growth rates of real profits (Austria and Japan) and real GDP (USA). This is in line with the proposition that stock market valuations play no role for investment decisions when fundamentals are controlled for.

Investment growth adjusts to deviations from both long-run relations in Austria and the USA, to deviations from the second one in Japan (Table 6). This might point to causality from stock markets to investment if stock price changes are responsible for these disequilibria. With FEVD results (Table 7) we see that innovations in real GDP growth are also, but mainly within one quarter, relevant for investment growth in Japan. Unit labour costs play a similar role for U.S. fixed capital formation.

A traditional argument for the absence of Granger causality from stock returns to investment growth is that delivery, planning and construction lags make a year too short a time to observe a reaction (Lamont, 1999). This is in contrast with the explanation of e.g. Tease (1993) that managers simply may ignore short-term changes in stock prices if these do not coincide with their view of business prospects, or that stock markets may give false signals and these are ignored. The stock market then is a 'sideshow' and a positive correlation between stock returns and the growth of investment only measures a spurious effect (Gjerde et al., 2001, pp. 574 f.).

6.2.2 Stock markets and consumption

Quarterly data of private consumption, GDP, inflation, a long-term interest rate and stock prices are employed in the third vector error correction model. The latter comprise 3 lags in the Austrian case and two lags with Japanese and U.S. series. Rather surprisingly, no

[12]The sample ranges from 1970 (1980 for Japan) to 2000. See the appendix for a detailed description and data sources.

	AUSTRIA		JAPAN		USA	
	β_1	β_2	β_1	β_2	β_1	β_2
Investment		1.000				1.000
GDP					1.000	
Interest rate						-0.032
						(0.005)
Stock prices	1.000					0.257
						(0.104)
Compensation			1.000			1.807
						(0.310)
Profits		-3.520		-3.907		0.811
		(0.298)		(0.331)		(0.099)
Trend	-0.015	0.020		-0.011	-0.009	-0.032
	(0.002)	(0.002)		(0.002)	(0.000)	(0.004)

Table 4: Long-run relationships with quarterly data including investment (standard errors in parentheses).

cointegration is indicated between Austrian and U.S. variables so that these systems can be estimated in differences without any loss of relevant information. I found one cointegrating relation for Japan between the interest and the inflation rate. Granger causality test results are to be found in Table 8 for the consumption growth equations. Apart from own lags, only growth rates of real GDP signal subsequent growth of consumption in Austria and Japan.

The results of the U.S. model display a completely different picture. Granger causality tests as well as individual coefficients point to several cross-effects between the five variables. Past GDP growth is not significant for consumption growth rates, but there are contemporaneous interrelations between these two variables. Past inflation and interest rate increases depress growth rates of consumption. Stock returns lagged one quarter positively signal increasing growth of both real consumption and GDP. Table 9 gives the corresponding forecast error variance decompositions. The positive signal of rising U.S. stock returns for domestic real private consumption is shown also in figure 1.

7 Summary and Conclusions

I estimated several specifications to analyze comovements between stock returns and macroeconomic variables. Granger causality tests, impulse response functions and variance decompositions lead to the conclusion that the data do not support the hypothesis of perfect stock market efficiency. For each of the countries (Austria, Japan, USA), lagged macroeconomic information can be used to improve forecasts of stock returns. Stock re-

	AUSTRIA	JAPAN	USA
Δ Compensation	0.899	0.678	0.379
Δ GDP	0.105	0.198	0.028
Δ Profits	0.002	0.001	0.375
Δ Investment	0.000	0.240	0.059
Δ Interest rate	0.597	0.442	0.320
Δ Stock prices	0.217	0.496	0.390

Table 5: Granger causality test p-values: Investment growth equations.

	AUSTRIA		JAPAN		USA	
	$\beta_1' X_{t-1}$	$\beta_2' X_{t-1}$	$\beta_1' X_{t-1}$	$\beta_2' X_{t-1}$	$\beta_1' X_{t-1}$	$\beta_2' X_{t-1}$
Δ Investment	-0.036	-0.107	0.003	0.026	-0.120	0.060
	(0.019)	(0.039)	(0.056)	(0.012)	(0.056)	(0.030)
Δ Stock prices	-0.081	-0.149	-0.025	0.080	-0.262	0.209
	(0.027)	(0.058)	(0.301)	(0.066)	(0.176)	(0.094)

Table 6: Adjustment of Δ Investment and Δ Stock prices to long-run disequilibria: Coefficients of equilibrium error terms in the respective equations of the error correction models with quarterly data (standard errors in parentheses).

turns have delayed responses to departures from long-run equilibrium relations between the time series. These results are in line with those of Cheung and Ng (1998) who examine stock returns for five major economies.

Past U.S. and Japanese stock returns also are Granger causal for current ones. Variance decomposition results suggest that macroeconomic developments and shocks account for a relatively small fraction of stock return variation in these two countries. Movements in Japanese and U.S. stock market valuations are comparatively exogenous. Departures from the efficient market hypothesis, nevertheless, can be expected if there are costs of gathering and processing information (Campbell et al., 1997) and costs of getting prices to reflect information (Fama, 1991).

A more sensible version thereof would imply that prices reflect information from the point where the marginal benefits of acting on information - the profits to be made - exceed the marginal costs. As it therefore seems likely to find deviations from ‘perfect’ efficiency, the joint-hypothesis problem arises: the fact that we cannot state whether these deviations from the efficient market hypothesis are rational or irrational ones (Fama, 1991, p. 1577).

I also find that real appreciations of the Yen precede increases of real Japanese stock returns. Granger causality is reverse for the USA as rising stock returns signal a real appreciation of the dollar.

Stock returns do not have predictive content for changes in growth rates of industrial production, gross fixed capital formation or consumption. The exception from the rule is that U.S. stock returns are Granger causally prior to consumption and, rather weakly, retail sales growth. Nevertheless, investment and production growth react in Austria, Japan as well as in the USA, if long-term equilibrium relations between stock prices and other macroeconomic variables are disturbed. The causal role of stock prices in this context, however, is difficult to assess.

Explanations for 'pure' changes in stock returns not properly predicting real developments also are offered by the literature on behavioural finance. Additionally, investors may fail to properly forecast the future state of the economy because of substantial uncertainty and limited information about the structure of the economy or a slow process by which they learn about the prospective future. Acquiring the necessary information is both costly and difficult, making extrapolation of past developments a rational and risk-minimizing strategy (Barsky and De Long, 1992).

Finally, the error correction models I employ may not represent an adequate tool to describe times of structural change. The application of time series models which allow for shifts in behavioural and institutional regimes seems advisable for future research also on the relations between stock markets and the real economy.

	AUSTRIA		JAPAN		USA	
Δ Compensation	2.60	(1-14)	4.45	(3-20)	23.93	(10-38)
Δ GDP	10.26	(4-26)	22.43	(10-35)	28.62	(18-40)
Δ Profits	31.46	(13-46)	26.07	(11-34)	7.47	(2-21)
Δ Investment	51.32	(31-59)	37.07	(22-48)	33.78	(20-42)
Δ Interest rate	2.47	(1-13)	3.60	(2-15)	1.64	(1-9)
Δ Stock prices	1.89	(1-10)	6.38	(2-19)	4.56	(1-14)

Table 7: Forecast error variance decompositions for real gross fixed capital formation (95 % confidence intervals in parentheses).

	AUSTRIA	JAPAN	USA
Δ GDP	0.000	0.008	0.368
Δ Consumption	0.000	0.000	0.209
Δ Inflation	0.297	0.646	0.008
Δ Interest rate	0.668	0.348	0.045
Δ Stock prices	0.847	0.401	0.005

Table 8: Granger causality test p-values: Consumption growth equations.

	AUSTRIA		JAPAN		USA	
Δ GDP	22.94	(12-38)	41.24	(24-61)	27.17	(14-37)
Δ Consumption	72.60	(50-79)	54.02	(29-67)	41.11	(30-56)
Δ Inflation	2.54	(1-13)	0.62	(0-10)	21.08	(9-35)
Δ Interest rate	1.17	(1-9)	0.99	(0-11)	3.85	(1-12)
Δ Stock prices	0.76	(0-9)	3.12	(0-15)	6.79	(1-16)

Table 9: FEVD for real private consumption (with 95 % confidence intervals).

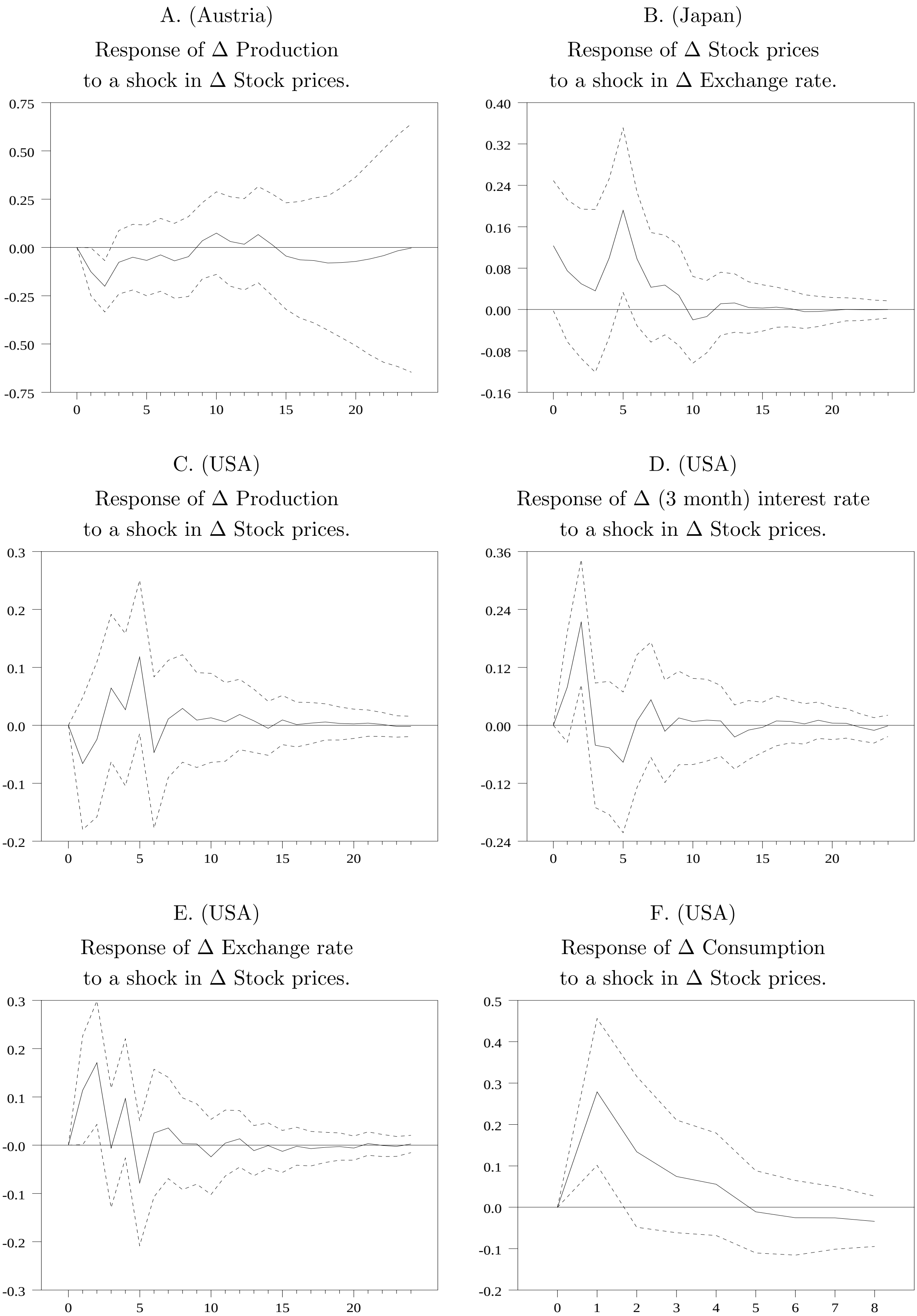

Figure 1: Selected impulse response graphs (with 95 % confidence intervals).

A Detailed description of the data

A.1 Monthly time series

Denotation	Description and source
Production	Industrial production quantity indices. Sources: Statistik Austria and OECD Main Economic Indicators (MEI) for the Japanese and U.S. time series.
Sales	Indices of real retail sales. Sources: Statistik Austria and MEI.
Stock prices	Stock price indices. Austria: WBI. Source: WBAG. Japan: TSE Topix. Source: MEI. USA: Common stock NYSE. Source: MEI. All series were deflated by the respective Consumer Price Index.
OECD production	OECD G7 real industrial production index excl. construction. Source: OECD.
Oil price	Oil price indices. Austria: Wholesale prices of mineral oil products excl. VAT. Source: Statistik Austria. Japan: Import prices of mineral fuels. Source: OECD Monthly Statistics of Foreign Trade. USA: Producer prices of refined petroleum products. Source: Economagic.com.
Interest rate	Short-term interest rates. Austria: Three month interest rate in %, Euribor since January 1999. Sources: OEKB and ECB. Japan and USA: Certificates of Deposit three month interest rates in %. Source: MEI. Ex-post real interest rates were calculated using the next period's inflation rate.
Exchange rate	Real effective exchange rates. Source: MEI. A falling exchange rate index indicates an improvement in the competitive position.
Inflation	Inflation rates (in %) were calculated from the respective CPI.

The sample starts in 1976 (for Japan in 1979) and ends in 2000. All indices are set to 100 in 1995. Industrial production, retail sales, oil price and inflation rate series are led one month because of information lags. All variables are in logarithms except for real interest and inflation rates.

A.2 Quarterly time series

Denotation	Description and source
Investment	Real gross fixed capital formation. Sources: IFS (Austria and Japan), MEI (USA).
GDP	Real gross domestic product. Sources: MEI (Austria, USA) and IFS (Japan).
Interest rate	Austria: Long-term interest rate (1 year or more), public and semi-public sector bonds. Source: MEI. Japan: Prime lending rate. Source: IFS. USA: Bank prime lending rate. Source: IFS. Ex-post real interest rates were calculated using the next period's inflation rate.
Stock prices	Stock price indices. Quarters derived from months.
Compensation	Labour compensation. Austria: Hourly wage rate index. Source: MEI. Japan and USA: Unit labour cost indices. Source: MEI.
Profits	Corporate profits. Austria and Japan: Operating surplus from national income accounts. Source: OECD. USA: Corporate profits after tax. Source: MEI.
Consumption	Real private consumption. Sources: IFS (Austria) and MEI (Japan and USA).
Inflation	Inflation rates in %. Quarters derived from months.

The sample starts in 1970 (for Japan in 1980) and ends in 2000. Real values of nominal variables were calculated by use of the respective CPI. All variables are in logarithms except for real interest and inflation rates.

References

[1] Barro, R. J., 1989, The stock market and investment, NBER Working Paper No. 2925.

[2] Barsky, R. B. and J. B. De Long, 1992, Why does the stock market fluctuate?, NBER Working Paper No. 3995.

[3] Bernanke, B., Gertler, M. and S. Gilchrist, 1994, The financial accelerator and the flight to quality, NBER Working Paper No. 4789.

[4] Binswanger, M., 1999, Stock markets, speculative bubbles and economic growth (Edward Elgar).

[5] Blanchard, O., Rhee, C. and L. Summers, 1993, The stock market, profit, and investment, Quarterly Journal of Economics 108, 115-136.

[6] Bond, S. R. and J. G. Cummins, 2000, The stock market and investment in the New Economy: Some tangible facts and intangible fictions, Brookings Papers on Economic Activity, 61-124.

[7] Boone, L., Giorno, C. and P. Richardson, 1998, Stock market fluctuations and consumption behaviour: Some recent evidence, OECD Economics Department Working Paper No. 208.

[8] Bosworth, B., 1975, The stock market and the economy, Brookings Papers on Economic Activity, 257-300.

[9] Campbell, J. Y., Lo, A. W. and A. C. MacKinley, 1997, The econometrics of financial markets (Princeton University Press).

[10] Chen, N-F., Roll, R. and S. A. Ross, 1986, Economic forces and the stock market, Journal of Business 59, 383-403.

[11] Cheung, Y.-W. and L. K. Ng, 1998, International evidence on the stock market and aggregate economic activity, Journal of Empirical Finance 5, 281-296.

[12] Choi, J. J., Hauser, S. and K. J. Kopecky, 1999, Does the stock market predict real activity? Time series evidence from the G-7 countries, Journal of Banking and Finance 23, 1771-1792.

[13] Chopin, M. and M. Zhong, 2000, Stock returns, inflation and the macroeconomy: The long- and short-run dynamics, mimeo.

[14] Doornik, J. A., Hendry, D. F. and B. Nielsen, 1998, Inference in cointegrating models: UK M1 revisited, Journal of Economic Surveys 12, 533-572.

[15] Dynan, K. E. and D. M. Maki, 2001, Does stock market wealth matter for consumption?, Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series, No. 2001-23.

[16] Enders, W., 1995, Applied econometric time series (Wiley).

[17] Fama, E. F., 1970, Efficient capital markets: A review of theory and empirical work, The Journal of Finance 25, 383-417.

[18] Fama, E. F., 1991, Efficient capital markets: II, The Journal of Finance 46, 1575-1617.

[19] Franses, P. H., 1999, How to deal with intercept and trend in practical cointegration analysis?, Research Report 9904/A, Econometric Institute, Erasmus University Rotterdam.

[20] Gjerde, Ø., Knivsflå, K. H. and F. Sættem, 2001, The stock market and investment in the small and open Norwegian economy, Empirical Economics 26, 565-580.

[21] Gjerde, Ø. and F. Sættem, 1999, Causal relations among stock returns and macroeconomic variables in a small, open economy, Journal of International Financial Markets, Institutions and Money 9, 61-74.

[22] Granger, C. W. J., Huang, B.-N. and C. W. Yang, 1998, A bivariate causality between stock prices and exchange rates: Evidence from the recent Asia flu, Discussion Paper 98-09, University of California, San Diego, Department of Economics.

[23] IMF, World Economic Outlook, May 2000.

[24] Johansen, S., 1995, Likelihood-based inference in cointegrated vector autoregressive models (Oxford University Press).

[25] Kwon, C. S. and T. S. Shin, 1999, Cointegration and causality between macroeconomic variables and stock market returns, Global Finance Journal 10, 71-81.

[26] Lamont, O., 1999, Investment plans and stock returns, NBER Working Paper No. 6973.

[27] Lee, B.-S., 1992, Causal relations among stock returns, interest rates, real activity, and inflation, The Journal of Finance 47, 1591-1603.

[28] Leigh, L., 1997, Stock market equilibrium and macroeconomic fundamentals, IMF Working Paper WP/97/15.

[29] Maddala, G. S. and I-M. Kim, 1998, Unit roots, cointegration, and structural change (Cambridge University Press).

[30] Maysami, R. C. and T. S. Koh, 2000, A vector error correction model of the Singapore stock market, International Review of Economics and Finance 9, 79-96.

[31] Mooslechner, P., 1998, Die Geldvermögensposition privater Haushalte in Österreich, WIFO Monatsberichte, No. 2, 121-123.

[32] Morck, R., Shleifer, A. and R. W. Vishny, 1990, The stock market and investment: Is the market a sideshow?, Brookings Papers on Economic Activity, 157-215.

[33] Nakagawa, S. and T. Shimizu, 2000, Portfolio selection of financial assets by Japan's households, Bank of Japan Research Paper.

[34] Oesterreichische Nationalbank (OeNB), 2001a, The Austrian financial markets.

[35] Oesterreichische Nationalbank (OeNB), 2001b, Financial market stability report 1.

[36] Otoo, M. W., 1999, Consumer sentiment and the stock market, Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series, No. 1999-60.

[37] Pagano, M., Panetta, F. and L. Zingales, 1996, The stock market as a source of capital: Some lessons from initial public offerings in Italy, European Economic Review 40, 1057-1069.

[38] Poterba, J. M. and A. A. Samwick, 1995, Stock ownership patterns, stock market fluctuations, and consumption, Brookings Papers on Economic Activity, 295-372.

[39] Riley, J., 1999, Australian stock market: Efficiency and international linkages, Proceedings of the Queensland Finance Conference.

[40] Runkle, D. E., 1987, Vector autoregressions and reality, Federal Reserve Bank of Minneapolis, Research Department Staff Report 107.

[41] Starr-McCluer, M., 1998, Stock market wealth and consumer spending, Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series, No. 1998-20.

[42] Stock, J. H. and M. W. Watson, 1998, Business cycle fluctuations in U.S. macroeconomic time series, NBER Working Paper No. 6528.

[43] Tease, W., 1993, The stock market and investment, OECD Economic Studies No. 20, 41-63.

[44] Tracy, J. and H. Schneider, 2001, Stocks in the household portfolio: A look back at the 1990s, Federal Reserve Bank of New York, Current Issues in Economics and Finance 7.

[45] Waschiczek, W. and F. Fritzer, 2000, Austrian stock market survey and outlook, Oesterreichische Nationalbank, Focus on Austria, 86-108.