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**Working Paper**

## The impact of changes in asset prices on real economic activity: A cointegration analysis for Germany

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UNIVERSITÄT POTSDAM

Wirtschafts- und Sozialwissenschaftliche Fakultät

**STATISTISCHE DISKUSSIONSBEITRÄGE**

**Nr. 38**

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# STATISTISCHE DISKUSSIONSBEITRÄGE

Nr. 38

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## **The Impact of Changes in Asset Prices on Real Economic Activity: A Cointegration Analysis for Germany**

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## **Abstract**

This paper reviews theoretical and empirical evidence of asset price movements impact on the real economic activity. A key channel is the wealth effect on consumption. Fluctuations in stock prices and housing prices influence the households wealth and could have important impacts on households consumption. In addition, stock prices may affect corporate sector investments and property prices may affect building activity. Here, the method of cointegration is used to estimate the wealth effect and the investment effect in aggregate time series for Germany after the Reunification in 1990. Moreover, we discuss the role of asset prices in the monetary policy strategy of the ECB.

**JEL-Codes:** C32, E21, E22, E58

**Key words:** Stock Prices, Property Prices, Consumption, Investment, Central Banking Policy



## 1 Introduction

A decline in prices of residential properties in the United States have caused a collapse of building activity, and the housing market, and leads over different channels to a cyclical downturn in the whole world. As things followed the stock market also crashed. This asset meltdown is one reason for the recession in most OECD countries in the last quarters. Consumer, faced with tighter credit and falling house values, will need to cut consumer spending, slowing the economy and depressing the business climate. Banks who have lost substantial amounts of equity capital need to maintain minimum equity-debt ratios will force to curtail business lending and hindering investment demand.<sup>1</sup> Large asset price fluctuations may trigger banking failures throughout the system and, hand in hand with credit cycles, affect the financial stability with further impact on real economic activity.

The widespread liberalization of financial markets and deregulation of the mortgage markets in the 1980s has increased the interest in asset price movements, in particular among the central banks. This is primarily due to the fact that stock and property prices, might have a direct impact on economic activity, mainly through wealth effects on consumption and through Tobin's  $q$  and balance sheet effects on investments. Moreover, asset prices have a central collateral role in the lending sector. Asset prices aggregate information from the economic agents and might be a leading indicator of the future economic activity.

Since the mid-1990s, large movements in stock prices led to extensive empirical research about the quantitative linkages between asset prices and the real economy.<sup>2</sup> While most of the studies have focussed on the USA, this paper will find empirical evidence for Germany.

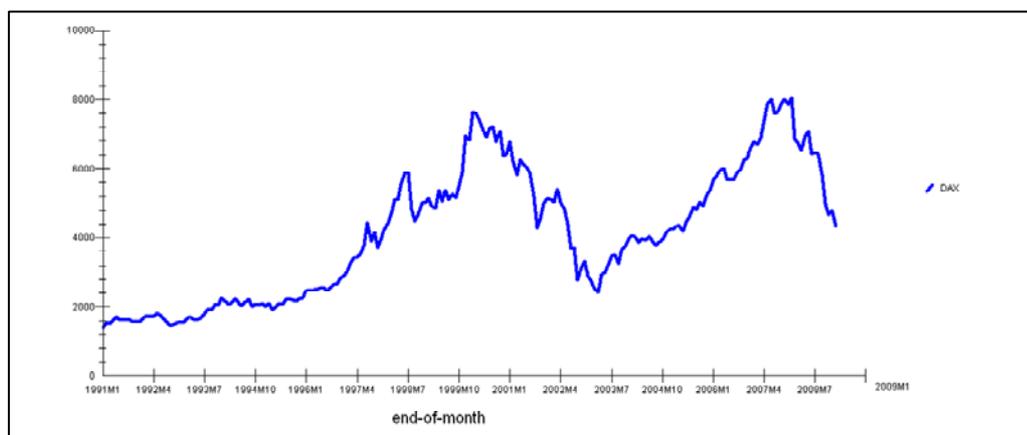


Figure 1: Deutscher Aktienindex (DAX) 1991/1 – 2009/1

<sup>1</sup> NASTANSKY and STROHE (2010), p. 28.

<sup>2</sup> ALTISIMO ET AL. (2005); NASTANSKY (2008).

The sharp rise in stock prices in the second half of the 1990s and from 2003 to 2007 have received much attention on the influence of stock market on aggregate economy, especially the corporate investments. In the last year, the stock prices fell dramatically. The German stock market index (DAX) halved in value. How much of this decline has been transmitted into real economic activity?



**Figure 2: Property Prices in Germany 1990 – 2008**

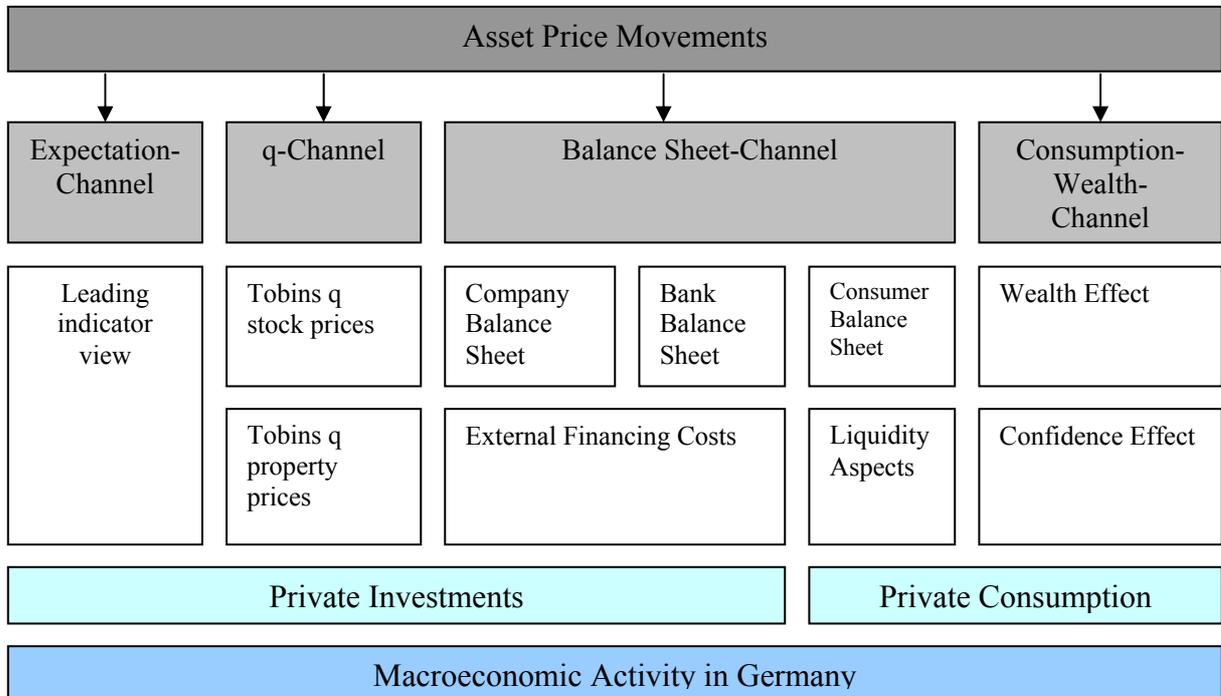
The development of property prices in Germany is displayed in figure 2. The uptrend was weaker in Germany than in other developed countries. Furthermore, property prices fluctuate comparatively little. Cyclical pattern can be observed, but movements are moderate. However, there was no decline in residential property prices in Germany in 2008.

## **2 Transmission Mechanisms from Asset Prices to Consumption and Investments**

The process through which monetary policy may affect the economy is known as the monetary transmission mechanism. The asset markets, primarily the stock market and the property market, are important elements in this complex and long chain of causes and effects which describes the linkages between monetary policy, asset prices and the supply and demand conditions on real economy.<sup>3</sup> Fluctuations in the stock and property market that are influenced by monetary policy impulses could have important impacts on the economic activity. The expansionary monetary policy effects of lower interest rates make stocks more attractive, which bids up stock prices. Similarly, interest rate reductions make it cheaper to finance properties, causing property prices to go up.

<sup>3</sup> ECB (2002), p. 46.

In theory, asset price movements may have direct and indirect effects on consumption and investments via four main channels: the q-channel and expectation channel on private investments, the balance sheet-channel, and the consumption-wealth-channel on private consumption (figure 3).



**Figure 3: Overview on the main transmission channels**

Source: Nastansky (2008), p. 11.

The asset prices could influence the economic activity over the households wealth, the balance sheet of companies and banks, the capital costs and the expectations of consumer (consumer sentiment) and firms (business climate).

The following section analyses the main transmission mechanisms from fluctuations in the stock prices and property prices onto households consumption and corporate investments:<sup>4</sup>

<sup>4</sup> MISHKIN (2001), pp. 1-9.

## **A. Transmission Mechanisms from Asset Prices to Consumption**

- *Wealth Effect:* When property prices or stock prices rise permanently, the wealth of homeowners and shareholders increases. Assuming that economic agents try to smooth their consumption over time, the higher wealth leads to higher current and future spending. The households consumption can rise if the consumers realize their gains or damp their savings.
- *Confidence Effect:* Fluctuations in stock prices may signal expectations to the future economic activity, which may influence consumer confidence and actual consumption spending – even of households that do not own stocks.
- *Household Liquidity Effect:* An increase in asset prices raises the value of collateral. Borrowing against this value allows the households to increase consumption. If credit is constrained, the households cannot react accordingly to higher asset prices.

## **B. Transmission Mechanisms from Asset Prices to Investments**

- *Tobin's q:* A change in stock prices implies a change in the cost of raising equity capital to finance corporate investment. Tobin's q is defined as the market value of firms divided by the replacement cost of capital. An increase in stock prices offers the possibility to issue stocks at a high price relative to the replacement cost and leads to an increase in investment spending.
- *Leading indicator view:* Changes in stock prices may reflect a reassessment of the short-term prospects for economic growth, as consumer spending and corporate earnings.<sup>5</sup> A general rise of stock prices may lead companies to higher profit expectations and extended investments.
- *Firm Balance Sheet Effect:* Because of asymmetric information in credit market, the ability of firms to borrow depends on the value of collateral they can offer. A rise in asset prices will improve the balance sheet of companies. The higher collaterals facilitate the access to external funds for investments.

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<sup>5</sup> POTERBA and SAMWICK (1995), p. 296.

### 3 Econometric Framework

The consumption or investment function to be estimated later in this paper are considered as a kind of long-run equilibria or cointegrating relations within error correction models. The changes in the target variable in period  $t$  depend on the deviations from that specific equilibrium in the previous period. A more general assumption is that these change also depend on the changes of all variables in period  $t-1$ .

For simplicity, let be

$$x_{1t} = \beta_1 x_{2t} + e_t$$

the cointegrating (equilibrium) relation for two first order integrated variables  $x_{1t}$  and  $x_{2t}$  and a stationary error  $ect_t = x_{1t} - \beta_1 x_{2t}$ .

One possible error correction model (ECM) containing a first order autoregressive term could be then:

$$\Delta x_{1t} = \varphi_1 \Delta x_{1t-1} + \varphi_2 \Delta x_{2t-1} + \alpha [x_{1t-1} - \beta_1 x_{2t-1}] + u_t$$

with  $\Delta x_{1t}$ ,  $\Delta x_{2t}$  and  $x_{1t} - \beta_1 x_{2t}$  assumed to be stationary. The coefficients usually are estimated by the two stage Engle-Granger algorithm. The error correction coefficient  $\alpha$  must be negative for effectively correcting deviations from the equilibrium. The amount of  $\alpha$  indicates the velocity of re-approaching to the state of equilibrium.

This ECM can be extended by an analogous equation for  $x_{2t}$  to a most simple vector error correction model (VECM):

$$\begin{aligned} \Delta x_{1t} &= \varphi_{11} \Delta x_{1t-1} + \varphi_{12} \Delta x_{2t-1} + \alpha_1 [x_{1t-1} - \beta_1 x_{2t-1}] + u_{1t} \\ \Delta x_{2t} &= \varphi_{21} \Delta x_{1t-1} + \varphi_{22} \Delta x_{2t-1} + \alpha_2 [x_{1t-1} - \beta_1 x_{2t-1}] + u_{2t} \end{aligned}$$

The same can be written using vector and matrix calculus:

$$\begin{pmatrix} \Delta x_{1t} \\ \Delta x_{2t} \end{pmatrix} = \begin{pmatrix} \varphi_{11} & \varphi_{12} \\ \varphi_{21} & \varphi_{22} \end{pmatrix} \begin{pmatrix} \Delta x_{1t-1} \\ \Delta x_{2t-1} \end{pmatrix} + \begin{pmatrix} \alpha_1 \\ \alpha_2 \end{pmatrix} (1, -\beta_{12}) \begin{pmatrix} x_{1t-1} \\ x_{2t-1} \end{pmatrix} + \begin{pmatrix} u_{1t} \\ u_{2t} \end{pmatrix}$$

or shorter in full matrix and vector notation:

$$\Delta \mathbf{x}_t = \mathbf{\Phi} \Delta \mathbf{x}_{t-1} + \mathbf{\alpha} \mathbf{\beta}' \mathbf{x}_{t-1} + \mathbf{u}_t$$

with  $\mathbf{x}_t$  the vector of the integrated variables under consideration,  $\mathbf{\Phi}$  the coefficient matrix of the autoregressive terms,  $\mathbf{\alpha}$  the vector of the error correction coefficients and  $\mathbf{\beta}$  the cointegrating vector, i.e. the vector of the coefficients of the cointegrating relation. This

vector equation is applicable to a VECM for more than two variables with only one cointegrating relation as well. Now cointegrating vectors can consist of  $k$  elements if the corresponding cointegrating relation includes all variables. But because sets of  $k$  integrated variables could have up to  $k-1$  cointegrating vectors the model equation should be rewritten to

$$\Delta \mathbf{x}_t = \Phi \Delta \mathbf{x}_{t-1} + \mathbf{A} \mathbf{B}' \mathbf{x}_{t-1} + \mathbf{u}_t$$

with  $\mathbf{B}$  being the  $(k \times r)$  matrix of  $k$ -dimensional cointegrating vectors and  $\mathbf{A}$  the corresponding  $(k \times r)$  matrix of error correction coefficients. Actually, the variable vector  $\mathbf{x}_t$  is assumed to be *vector* integrated of order 1 (I(1)), i.e.  $\Delta \mathbf{x}_t$  is *vector* stationary. But for the purpose of this paper, it will be sufficient to test each individual variable *independently* for integration and stationarity by augmented Dickey-Fuller-test (ADF).

This VECM can be further generalised by introducing up to  $p$  time lags in the vector autoregressive presentation of the first differences in the model. This is equivalent to a VAR(p+1) presentation of the levels  $\mathbf{x}_t$ . Basically, a deterministic shift vector  $\boldsymbol{\mu}$  of individual intercepts  $\mu_i$  ( $i=1, \dots, k$ ) can be attached as well:

$$\Delta \mathbf{x}_t = \boldsymbol{\mu} + \Phi_1 \Delta \mathbf{x}_{t-1} + \dots + \Phi_p \Delta \mathbf{x}_{t-p} + \mathbf{A} \mathbf{B}' \mathbf{x}_{t-1} + \mathbf{u}_t$$

An intercept can be included in cointegrating relations alternatively, as well as a deterministic time trend. The maximum lag  $p$  can be easily found by Schwarz-Bayes or Akaike information criterion. The number of cointegrating vectors (lines in  $\mathbf{B}'$ )  $r$  can be determined as the rank of the matrix  $\mathbf{\Pi} = \mathbf{A} \mathbf{B}'$  by several tests, such as the test of maximum eigenvalue of  $\mathbf{\Pi}$ . Under rather general conditions, the coefficient matrices  $\mathbf{A}$ ,  $\mathbf{B}$  and  $\Phi_j$  can be estimated by least squares (LS), generalised least squares (GLS) and maximum likelihood (ML)<sup>6</sup>. In the following sections of this paper, the ML method known as Johansen procedure<sup>7</sup> as presented in the software MICROFIT will be used.

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<sup>6</sup> More in LÜTKEPOHL (2005), pp. 269-323.

<sup>7</sup> PESARAN and PESARAN (1997), pp. 433-437.

## 4 Empirical Results

In the following section, our empirical research is based on aggregate time series for the unified Germany in period 1991Q1 to 2008Q4. We estimate the impact of asset prices (stock and property prices) on aggregate consumption (*wealth effect*) and aggregate investments (*investment effect*). We conduct a cointegration analysis and use the Johansen procedure. Running the Johansen approach and estimating the vector error correction model (VECM) allows to estimate the long-term effects and to analyse short-term adjustment process.

### 4.1 Asset Prices and Consumption

The estimation of wealth effect on consumption is based on specification of the following log-linear macroeconomic consumption function:

$$\ln C_t = \alpha + \beta \ln Y_t^D + \delta_1 \ln DAX_t + \delta_2 \ln IRP_t + \kappa I_t^M + u_t$$

where  $\ln$  is the natural logarithm  $C_t$  is the real consumption of private households in quarter  $t$ ,  $Y_t^D$  the real disposable income of households,  $DAX_t$  the price adjusted Deutsche Aktienindex in previous quarter,  $IRP_t$  the price adjusted Index Residential Properties in previous quarter and  $I_t^M$  is the interest on overnight money in quarter  $t$ . Above equation implies a linear relationship between consumption, asset prices and disposable income. The parameters  $\delta_1$  and  $\delta_2$  reflect the wealth effect on consumption out of stock and residential property prices. Before estimating the VECM, we need to ensure that the variables are in fact integrated, I(1).

**Tab. 1: Results of Augmented Dickey-Fuller-Test**

Variable	Regression	Lags	Test Statistic	95% Critical Value	Decision
$\ln C$	C,T	2	-0.5930	-3.4749	ns
$\ln Y^D$	C,T	3	-0.5246	-3.4759	ns
$I^M$	C,T	1	-2.5132	-3.4739	ns
$\ln DAX$	C,T	1	-1.9685	-3.4739	ns
$\ln IRP$	C,T	2	-2.2664	-3.4749	ns
$\Delta \ln C$	C	1	-8.9525	-2.9035	s
$\Delta \ln Y^D$	C	2	-8.4378	-2.9042	s
$\Delta I^M$	C	0	-3.3501	-2.9029	s
$\Delta \ln DAX$	C	0	-5.1228	-2.9029	s
$\Delta \ln IRP$	C	1	-3.6185	-2.9035	s

Note: The Schwarz Bayesian criterion suggests selecting order of ADF regression. The Dickey-Fuller regressions include an intercept (C) and/or a linear trend (T). ns - nonstationarity

Unit root tests confirm on the 5%-level that all variables are integrated of order one (table 1).

Hence, we have more than two I(1) variables we must at first estimate the cointegration rank. Before, we have to select the order of the cointegrating VAR. The Schwarz Bayesian criterion suggests a VAR of order three, viz. a VECM of order two. We include a restricted intercept but not a trend in the cointegrating relations. The maximum eigenvalue test is applied to test rank  $r$ .

**Tab. 2: Results of Maximum Eigenvalue-Test**

H <sub>0</sub>	H <sub>1</sub>	Test Statistic	95% Critical Value
r = 0	r = 1	59.49	34.40
<b>r = 1</b>	r = 2	20.83	28.27
r = 2	r = 3	13.25	22.04
r = 3	r = 4	9.13	15.87
r = 4	r = 5	3.01	9.16

Note:  $r$  denotes the number of cointegrating vectors.

The maximum eigenvalue test suggests that there is a single cointegrating relation between consumption, income, asset prices and money market rate (table 2). Estimating the vector error correction model for  $r = 1$  gives the following long-term relationship (cointegrating relation):<sup>8</sup>

$$\hat{c}_t = 1.11 y_t^D + 0.04 dax_t + 0.12 irp_t - 0.005 I_t^M - 1.76$$

(0.09)
(0.004)
(0.04)
(0.001)
(0.64)

Consequently: In Germany after Reunification, there are significant wealth effects on consumption out of different asset prices. A 10% rise in stock prices (DAX) leads in the next quarter to an increase in private consumption of 0.4%. In comparison to other countries, the effect of the stock market on consumption in Germany is quite moderate.<sup>9</sup> In the sample period the effect of residential property prices on consumption is significantly positive and the estimated elasticity is trice as large as the elasticity of stock market prices. Case et al. (2004) support for an international panel (Germany included) that changes in housing prices have larger impact than changes in stock prices in influencing households consumption.<sup>10</sup> The elasticity of consumption with respect to the disposable income is 1.11. This may be signalling the importance of the income for household's consumption. Furthermore, we find a weak negative impact of money market rate on consumption.

<sup>8</sup> The coefficient for consumption is normalized to one. In brackets you see the asymptotic standard errors of the cointegrating coefficients. The lower case notation means the natural logarithms.

<sup>9</sup> NASTANSKY (2008), pp. 219-224.

<sup>10</sup> CASE ET AL. (2004), p. 24.

In the long run, trends in consumption are closely related to trends in income, asset prices and interest rates. Consumption deviates from this long-run equilibrium in the short term but will tend to gradually revert to equilibrium over time. This process is modelled as an error correction mechanism.

Estimated vector error correction model:<sup>11</sup>

$$\begin{aligned}\Delta \hat{c}_t &= -0.338 \Delta y_{t-1}^D - 0.358 \Delta c_{t-2} + LD_1 - 0.733 ecm_{t-1} \\ &\quad (0.165) \quad (0.171) \quad (0.114) \\ \Delta \hat{y}_t^D &= -0.647 \Delta y_{t-1}^D + LD_2 - 0.420 ecm_{t-1} \\ &\quad (0.216) \quad (0.149) \\ \Delta \hat{dax}_t &= 3.59 \Delta c_{t-1} + 0.45 \Delta dax_{t-1} - 4.291 \Delta irp_{t-2} + LD_3 + 0.555 ecm_{t-1} \\ &\quad (1.744) \quad (0.142) \quad (2.073) \quad (1.215) \\ \Delta \hat{irp}_t &= -0.246 \Delta c_{t-1} + 0.501 \Delta y_{t-1}^D + 0.408 \Delta irp_{t-1} + 0.373 \Delta irp_{t-2} + LD_4 + 0.128 ecm_{t-1} \\ &\quad (0.089) \quad (0.090) \quad (0.117) \quad (0.107) \quad (0.062) \\ \Delta I_t^M &= +16.998 \Delta irp_{t-1} + 0.675 \Delta I_{t-1}^M + LD_5 + 1.18 ecm_{t-1} \\ &\quad (8.164) \quad (0.169) \quad (4.361)\end{aligned}$$

with  $ecm_t = +1c_t - 1.11y_t^D - 0.04dax_t - 0.12irp_t + 0.005I_t^M + 1.76$

The dynamic specification exhibits significant error correction coefficient for consumption, with the expected sign. The speed of consumption to the equilibrium level of consumption appears to be relatively fast. The asset prices contribute to lowering the deviation from the long-run relationship. However, there is no empirical evidence for positive short-run wealth effect on consumption out of stock and residential property prices.

#### 4.2 Asset Prices and Investments

The estimation of so called investment effect is based on specification of the following log-linear macroeconomic investment function:

$$\ln J_t = \alpha + \beta \ln Y_t + \delta_1 \ln DAX_t + \delta_2 \ln PMI_t + \kappa I_t^{LR} + u_t$$

where  $J_t$  is the real fixed investments in quarter  $t$ ,  $Y_t$  the real gross domestic product,  $DAX_t$  the price adjusted Deutsche Aktienindex in previous quarter,  $PMI_t$  the price adjusted Property Market Index in previous quarter and  $I_t^{LR}$  is the long-run interest rate in quarter  $t$ . The parameters  $\delta_1$  and  $\delta_2$  reflect the effect of stock and property prices on aggregate investments. Before estimating the VECM, we need to ensure that the variables are in fact I(1).

<sup>11</sup>  $LD_i$  includes the on the 5%-level non significant lagged differences of the variables in equation i.

**Tab. 3: Results of Augmented Dickey-Fuller-Test**

Variable	Regression	Lags	Test Statistic	95% Critical Value	Decision
$\ln J$	C,T	2	-2.2564	-3.4749	ns
$\ln Y$	C,T	1	-2.1705	-3.4739	ns
$I^{LR}$	C,T	1	-3.0072	-3.4739	ns
$\ln PMI$	C,T	2	-2.0599	-3.4749	ns
$\Delta \ln J$	C	1	-4.7516	-2.9035	s
$\Delta \ln Y$	C	0	-6.6593	-2.9029	s
$\Delta I^{LR}$	C	0	-5.6562	-2.9029	s
$\Delta \ln PMI$	C	1	-3.0558	-2.9035	s

Note: The Schwarz Bayesian criteria suggests selecting order of ADF regression. The Dickey-Fuller regressions include an intercept (C) and/or a linear trend (T). ns - nonstationarity

Again, the ADF tests confirm that on the 5%-level that all variables are integrated of order one (table 3). The Schwarz Bayesian criterion suggests a VECM of order two. We include a restricted intercept but not a trend in the cointegrating relations.

**Tab. 4: Results of Maximum Eigenvalue-Test**

$H_0$	$H_1$	Test Statistic	95% Critical Value
$r = 0$	$r = 1$	55.86	34.40
$r = 1$	$r = 2$	20.60	28.27
$r = 2$	$r = 3$	13.94	22.04
$r = 3$	$r = 4$	4.23	15.87
$r = 4$	$r = 5$	3.29	9.16

Note:  $r$  denotes the number of cointegrating vectors.

The maximal eigenvalue test suggests that there is a single cointegrating relation between investments, gross domestic product, asset prices and long-run interest rate (table 4). Estimating the vector error correction model gives the following long-term relationship:<sup>12</sup>

$$\hat{j}_t = \underset{(0.22)}{0.93} y_t + \underset{(0.02)}{0.17} dax_t + \underset{(0.23)}{0.52} pmi_t + \underset{(0.01)}{0.03} I_t^{LR} - \underset{(2.38)}{5.16}$$

Besides, asset price movements having an impact on consumption, they may also play an important role for investment spending of companies in Germany. A 10% rise in stock prices (DAX) leads in the next quarter to an increase in fixed investments of 1.7%. The long-run response of fixed investment to changes in property prices is significant and positive. The elasticity amounts to 0.52. But during last two decades the property prices fluctuate comparatively little. Therefore, the effects on the economic activity were limited.

<sup>12</sup> The coefficient for investments is normalized to one. In brackets you see the asymptotic standard errors of the cointegrating coefficients. The lower case notation means the natural logarithms.

The international evidence shows that the size of the investment effect depends on the importance of the equity markets and the liberalization of financial markets and deregulation of the mortgage markets.<sup>13</sup> Given the comparatively low stock market participation of German companies, the empirical analysis confirms the existence of the main transmission channels of stock price movements. Moreover, there is a strong positive dependence of fixed investment on gross domestic product. An increase in GDP leads the companies to upgrade their expectations and extend investment spending. We do not find a contemporaneous negative impact of long-run interest rate on fixed investment.

Estimated vector error correction model:<sup>14</sup>

$$\begin{aligned}\Delta \hat{j}_t &= +0.383\Delta j_{t-2} + 0.069\Delta dax_{t-2} + LD_1 - 0.025ecm_{t-1} \\ &\quad (0.187) \quad (0.034) \quad (0.071) \\ \Delta \hat{y}_t &= +0.170\Delta j_{t-2} - 0.005\Delta I_{t-2}^{LR} + LD_2 - 0.058ecm_{t-1} \\ &\quad (0.061) \quad (0.002) \quad (0.023) \\ \Delta \hat{dax}_t &= -1.809\Delta j_{t-1} + 5.668\Delta y_{t-1} + 0.445\Delta dax_{t-1} + 4.524\Delta y_{t-2} - 0.056\Delta I_{t-2}^{LR} + LD_3 + 1.105ecm_{t-1} \\ &\quad (0.677) \quad (2.067) \quad (0.111) \quad (1.958) \quad (0.028) \quad (0.244) \\ \Delta \hat{pmi}_t &= +0.294\Delta pmi_{t-1} + 0.505\Delta pmi_{t-2} + 0.006\Delta I_{t-2}^{LR} + LD_4 + 0.034ecm_{t-1} \\ &\quad (0.113) \quad (0.119) \quad (0.002) \quad (0.018) \\ \Delta I_t^{LR} &= +26.033\Delta y_{t-1} + 14.049\Delta pmi_{t-1} + 0.442\Delta I_{t-1}^{LR} - 0.314\Delta I_{t-2}^{LR} + LD_5 + 3.963ecm_{t-1} \\ &\quad (9.065) \quad (6.652) \quad (0.125) \quad (0.121) \quad (1.071)\end{aligned}$$

with  $ecm_t = +1j_t - 0.93y_t - 0.17dax_t - 0.52pmi_t - 0.03I_t^{LR} + 5.16$

The VECM provides no evidence for significant short-term investment effects out of stock and property prices in Germany. The adjustment coefficient in the investment error correction equation has the correct sign, but is not significant. The stock prices and the long-run interest rate strongly react to the past deviations from the found equilibrium relation.

## 5 Asset Prices and Monetary Policy

During the past several years, movements in asset prices have been attracting considerable attention from the monetary policymakers. Recent changes in stock and housing prices have been substantial impact on the real economic activity. To achieve the goal price stability, monetary policy makers have to understand the role that asset markets play in the monetary transmission mechanism if they are appropriately set policy instruments.<sup>15</sup>

<sup>13</sup> ALTISIMO ET AL. (2005), pp. 33-36.

<sup>14</sup>  $LD_i$  includes the on the 5%-level non significant lagged differences of the variables in equation i.

<sup>15</sup> MISHKIN (2001), p. 15.

Recent research has suggested that central banks pursuing inflation targets should ignore fluctuations in asset prices, because most changes in asset prices are transitory and weak related to the aggregate demand.<sup>16</sup> Bernanke and Gertler (2001) emphasise that monetary policy should not respond to changes in asset prices, except insofar as they signal changes in expected inflation.<sup>17</sup> It is nearly impossible to know for sure whether a given asset price movement results from fundamental factors or is a bubble, which asset price should be target and to what extent and in which form a central bank ought to intervene.

Cecchetti et al. (2003) prefer direct reaction of central banks to asset price misalignments. The policy of “leaning against the wind” already reacts to an incipient bubble. At an earlier stage central banks would adopt a restrictive policy to hamper the building-up of a bubble. The strategy of flexible inflation targeting might reduce the probability of asset price bubbles arising at all, which would also be a contribution to greater macroeconomic stability.<sup>18</sup>

Asset Prices and the European Central Bank (ECB):<sup>19</sup> „The ECB does not target asset prices. However, it needs to pay close attention to asset price movements with a view to preserving the stability of consumer prices over longer horizons.“ The ECB monitors asset prices as leading indicator of economic activity and assesses their impact on aggregate demand, credit markets and financial system. The growth of money and credit aggregates should be limited in the medium term to avoid liquidity-driven asset price misalignments.

The European Central Bank did not actively prevent asset price bubbles before the beginning of the current financial crisis. They even did not try to soften the breakdown of the asset prices.<sup>20</sup> But the global financial crisis has demonstrated the relevance of stable financial markets for monetary policy. Effective monetary, credit and capital markets are essential preconditions for taking advantage from measures issued by monetary policy. Central banks have to respond to them and to harmonise the stability target of the financial system with monetary strategies to be pursued.

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<sup>16</sup> LETTAU and LUDVIGSON (2004), p. 294.

<sup>17</sup> BERNANKE and GERTLER (2001), p. 257.

<sup>18</sup> CECCHETTI ET AL. (2003), p. 429.

<sup>19</sup> ECB (2005), p. 60.

<sup>20</sup> WEBER (2009), p. 3.

## **6 Conclusion**

Fluctuations of the stock market and property market influence macroeconomic behaviour, mainly, through their impact on consumer spending and companies investments. Additionally, consumption and investments generate important feedback effects on asset markets. In Germany after Reunification there are significant positive wealth effects on consumption and investments effects out of stock prices and property prices. Given the important position in the economy, the asset markets are of central concern to monetary policy makers. Central bankers must understand the role of stock and property market in the monetary transmission mechanism. However, asset prices should not be a target of the ECB's monetary policy.

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