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Correlation between stock market and GDP: empirical evidence from Switzerland

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1 Introduction

The Organization for Economic Cooperation and Development is an intergovernmental international economic organization composed of 38 market-economy countries, aiming to jointly address the economic, social and governance challenges brought about by globalization.

GDP is an important indicator to measure the economic status and development level of a country or region, and it is closely related to economic policies and markets. Some past studies have explored the impact of the stock market on GDP. We hope to extend these studies and explore whether GDP will in turn affect the stock market. Most of the OECD countries are developed economies, which are ideal samples for studying the relationship between the stock market and GDP.

The industrial structure of GDP has changed significantly over the past few decades. In the same time span, the stock index has also undergone large changes. However, changes in stock indices are sometimes out of sync with changes in GDP. A more obvious example is the creation and bursting of stock market bubbles. Exploring the relationship between the stock market and GDP is a breakthrough in the study of such issues.

2 Literatures

A theoretical relationship between stock prices and productivity within a country is derived by Kung and Schmid (2015)[1]. They construct a general equilibrium stochastic growth model with endogenous productivity growth and asset prices. The model shows that favorable economic conditions boost innovation and the development of new technologies. Since technological progress fosters long-run economic growth, endogenous innovation generates a powerful propagation mechanism for shocks reflected in persistent variation in long-term growth prospects.

Empirically, there is evidence that stock returns are strongly related (though opposite signs) to measures of future real activity[2]. This is consistent with a rational expectations view in which markets for goods and securities set current prices on the basis of forecasts of relevant real variables. in 17 advanced economics between 1870 and 2016, the data reveals two broad eras of stock market growth: the stock market grew at the same rate long-run rate as GDP during the period before the 1980s; and the capitalization growth accelerated far beyond that in GDP after the 1980s[3]. From 1991 to 2012, changes in share prices provide reliable predictions of near term future economic growth in the USA and the UK. However, changes in economic growth are not related to share price movements, while in the case of Japan, share price movements do not appear to be a useful leading predictor for near term economic growth and vice-versa[4].

This paper studies the long run equilibrium relationship between stock prices and domestic GDP for the OECD countries. We expect to find higher stock price growth in countries high GDP growth than in countries with low GDP growth.

3 Empirical Analysis

3.1 Data and Model

This study uses quarterly GDP growth rates and stock price from the OECD. The stock price is standardized with 2015=100. This study period is from 1960Q2 to 2022Q3. Also, we removed rows with missing values to keep the data frame tidy.

Based on the topics we explored, we constructed the following model:

$$R_{Index} = \alpha + \beta * R_{GDP,t+3} + \varepsilon$$

Among them, R_{Index} is the quarterly growth rate of the stock index, and $R_{GDP,t+3}$ is the quarterly growth rate of GDP. Since the share price may respond to GDP changes in

advance, we choose GDP data for three periods in advance.

3.2 Results

In the long run, the relationship between GDP and stock markets in OECD countries is not always consistent. As shown in the Figure 1 2, most of the changes in the stock price are in the same direction as the changes in $R_{GDP,t+3}$, but the magnitude of the changes greater than the change in GDP.

Switzerland is one of the most important financial markets in the world, with relatively open and transparent market information, making it a reasonable and typical research sample. Therefore, we used Switzerland as an example to perform regression.

The following Table 1 is the descriptive statistics of the sample. As far as Switzerland is concerned, GDP fluctuates around -7% to 7%, with an average of 0.55% and a standard deviation of 1.23, indicating that Switzerland's GDP growth is relatively stable. In Switzerland, the change in the stock market is greater than GDP, with an average of 1.59%, which is more consistent with the previous conclusion drawn from the chart, that is, the change in the stock market is greater than GDP.

In order to further explore the relationship between the two, we regressed the model and obtained the Figure 3, from which it can be observed that there is indeed a certain correlation between the two.

Regarding to the results or regression (Figure 4), the coefficient of $R_{GDP,t+3}$ is 0.0250, which is significant within the 95% confidence interval, which means that according to our model, for every 1% increase of GDP in t+3 period, the stock index will increase by 0.0250% in t period. This result is in line with our expectation. The stock index is positively correlated with the growth of GDP, but the growth rate is much smaller than that of GDP.

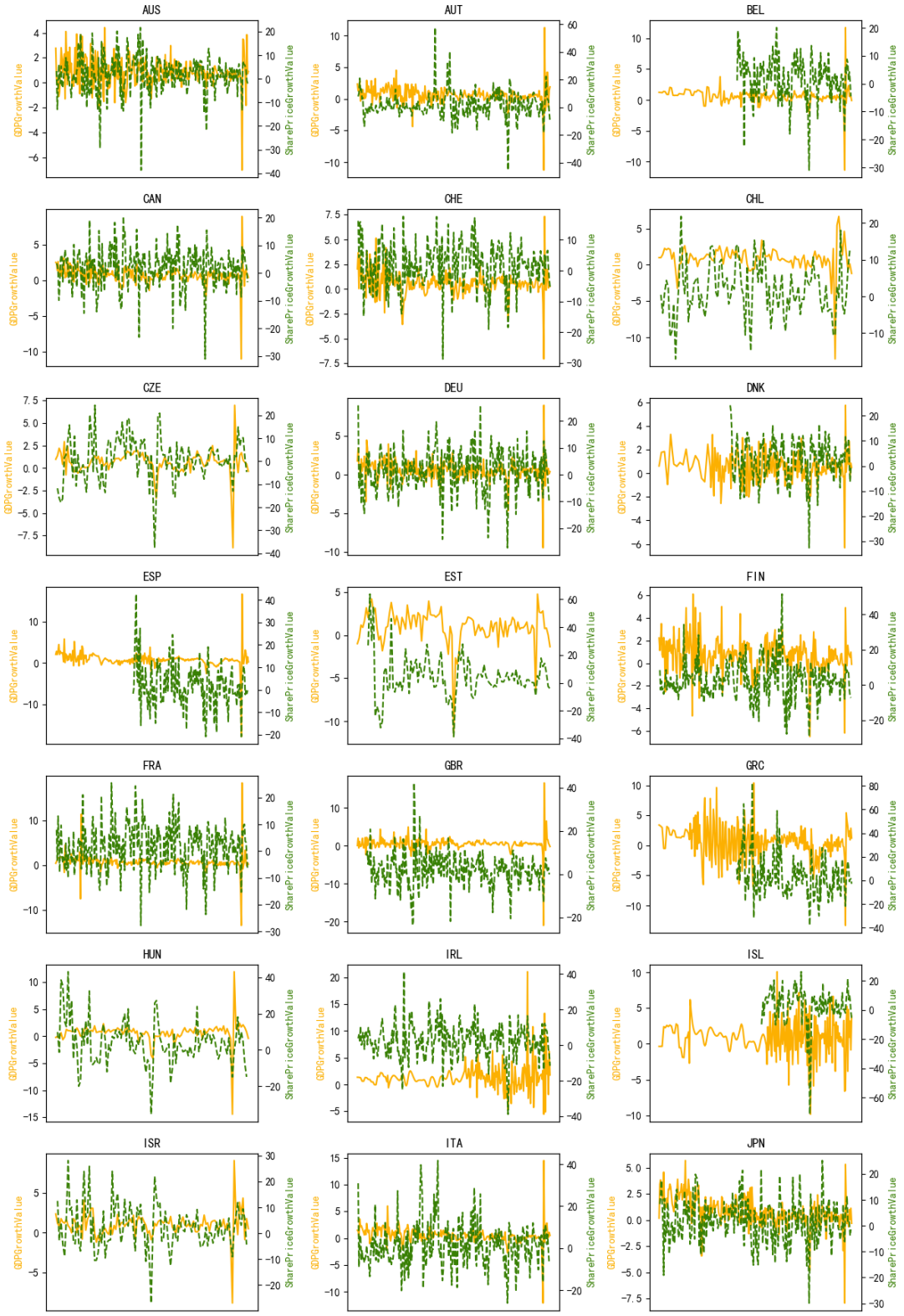

Figure 1: Relationship between GDP and stock market

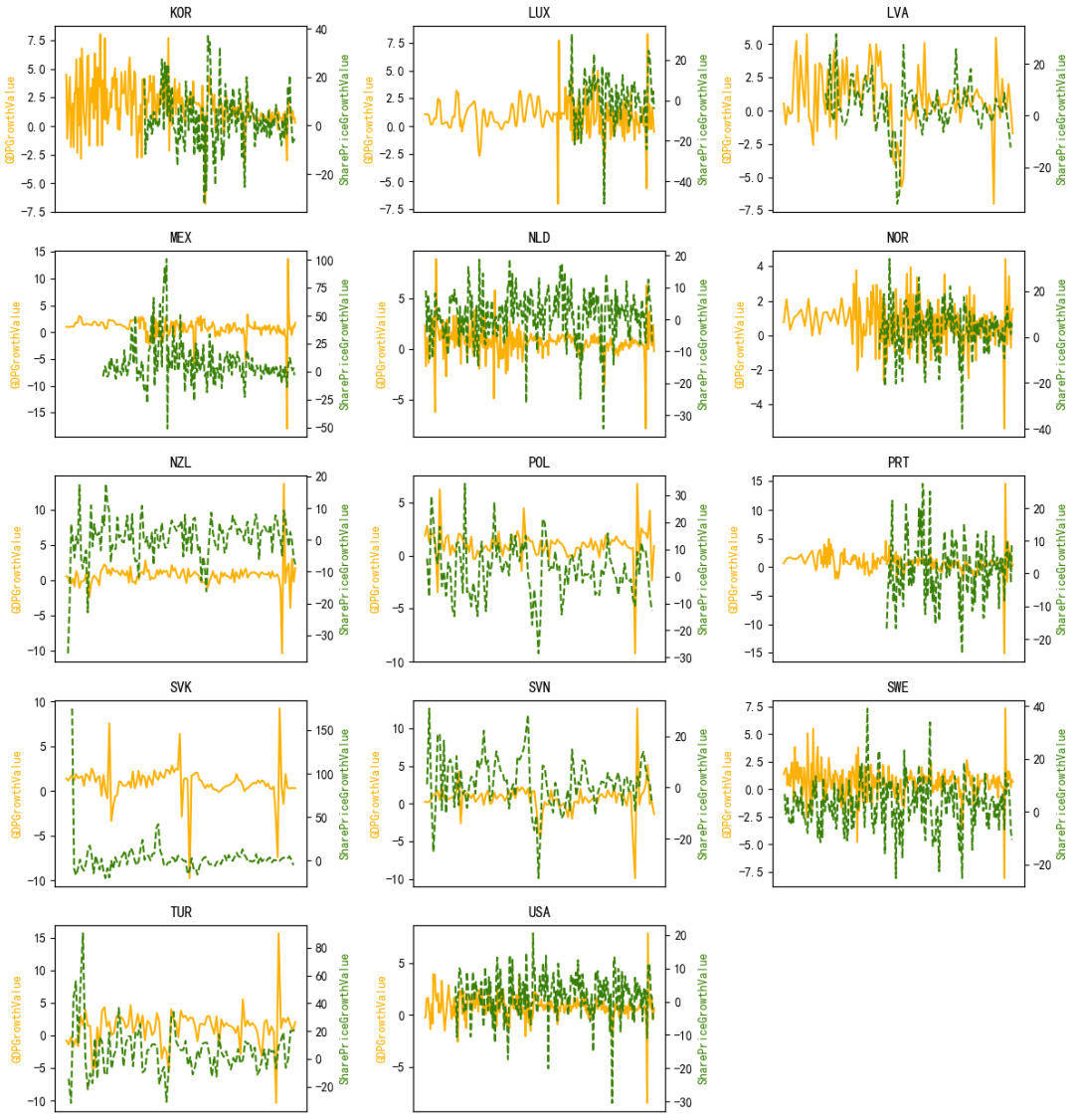

Figure 2: Relationship between GDP and stock market continued

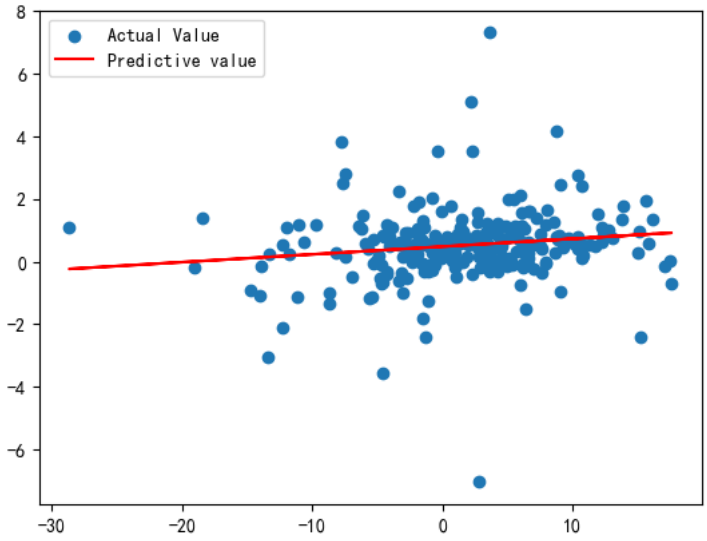

Figure 3: Regression Results

OLS Regression Results

Dep. Variable:	GDPGrowthValue	R-squared:	0.022
Model:	OLS	Adj. R-squared:	0.018
Method:	Least Squares	F-statistic:	5.361
Date:	Sat, 17 Dec 2022	Prob (F-statistic):	0.0214
Time:	17:35:11	Log-Likelihood:	-391.29
No. Observations:	245	AIC:	786.6
Df Residuals:	243	BIC:	793.6
Df Model:	1		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	0.4824	0.079	6.132	0.000	0.327	0.637
SharePriceGrowthValue	0.0250	0.011	2.315	0.021	0.004	0.046

Omnibus:	59.621	Durbin-Watson:	1.989
Prob(Omnibus):	0.000	Jarque-Bera (JB):	1307.480
Skew:	-0.102	Prob(JB):	1.21e-284
Kurtosis:	14.315	Cond. No.	7.50

Figure 4: Regression Results Table

Table 1: Statistical Summary

	GDPGrowthRate				SharePriceGrowthRate			
Location	max	min	mean	std	max	min	mean	std
AUS	4.418806	-7.020018	0.837857	1.181453	21.642014	-38.676460	1.704898	7.538439
AUT	11.232721	-11.243786	0.673663	1.447553	57.487021	-45.421095	1.539374	9.111118
BEL	11.731267	-11.397832	0.645568	1.271786	20.089567	-30.939630	1.654958	7.582937
CAN	8.983958	-11.042537	0.759495	1.262450	20.383706	-31.094573	1.672189	6.875763
CHE	7.315925	-7.047209	0.551725	1.234857	17.589432	-28.668096	1.593233	7.103834
CHL	6.665278	-12.951959	0.905039	1.927714	21.824056	-17.105582	1.756754	7.070759
CZE	6.953209	-8.848739	0.627159	1.416782	24.297158	-37.608644	0.918629	9.607779
DEU	9.004695	-9.481134	0.578807	1.366080	25.897645	-27.259745	1.248174	7.810234
DNK	5.776993	-6.312451	0.578683	1.173001	24.147734	-32.588907	2.724747	7.863246
ESP	16.637934	-17.826256	0.802796	1.908249	42.641475	-20.891714	2.022089	9.644056
EST	4.775670	-11.798107	0.972202	2.038534	63.787282	-38.600189	3.964411	15.021136
FIN	6.094493	-6.477614	0.681190	1.510952	51.582402	-29.403193	2.596351	10.345035
FRA	18.351564	-13.523350	0.654490	1.862877	25.503985	-27.777780	1.642906	8.156255
GBR	16.608614	-20.991373	0.583703	1.944663	42.213488	-23.731214	1.974376	7.642617
GRC	10.427888	-13.317789	0.664010	2.683935	82.429455	-38.075847	3.418555	17.401837
HUN	11.900000	-14.400000	0.647653	2.032294	43.123207	-35.489609	3.880780	12.070427
IRL	21.018326	-5.529750	1.254536	2.358158	41.199881	-38.845606	2.351390	9.342773
ISL	10.067048	-9.839834	0.916751	2.333316	26.033609	-71.236371	2.704795	12.284945
ISR	9.039196	-8.797409	0.991620	1.574280	28.047522	-26.934116	2.442914	8.484191
ITA	14.476293	-12.101330	0.572454	1.614337	41.689458	-26.205626	1.489691	10.221810
JPN	5.697546	-7.938036	0.866606	1.439967	25.163725	-29.888141	1.600391	8.079274
KOR	8.061462	-6.818022	1.732345	1.976849	37.779478	-32.305365	2.579035	11.191628
LUX	8.319050	-7.017609	0.875735	1.531374	32.698002	-51.003169	0.648093	11.797765
LVA	5.748584	-6.995186	0.885956	2.286839	31.419969	-33.997673	3.032875	9.713881
MEX	13.653575	-17.959204	0.887413	1.890981	100.788728	-51.124216	7.691543	18.606206
NLD	8.940364	-7.904426	0.678117	1.530104	18.927776	-34.219933	1.407653	7.523131
NOR	4.434557	-5.414676	0.761621	1.214504	33.991223	-39.924935	3.005149	10.131584
NZL	13.675110	-10.393865	0.653112	1.704997	17.646552	-35.670873	0.519457	6.737128
POL	6.764794	-9.206071	1.013821	1.584297	34.294900	-28.498625	2.329534	10.107595
PRT	14.588001	-15.119497	0.765960	1.823479	27.409212	-24.367060	1.531018	9.085552
SVK	9.207307	-9.739807	0.914681	1.955863	174.737950	-20.295488	2.147537	18.652152
SVN	12.617891	-9.888565	0.677273	2.027889	30.793790	-35.311504	1.928949	10.093353
SWE	7.325353	-8.058830	0.639892	1.406531	39.093618	-25.190601	2.683303	8.703745
TUR	15.649318	-10.371753	1.161359	2.806978	90.295744	-31.817736	5.707367	17.528920
USA	7.854483	-8.484336	0.766620	1.149958	20.519865	-30.435154	1.764790	6.110438

4 Conclusion

Using share price data in the OECD group, this paper studies the long-horizon relationship between share price growth and GDP growth. Generally, the stock price increases when GDP grows in T+3 period and deceases when GDP declines in T+3 period. It may indicate the perfect capital market where the share price incorporates the future market information. However, the relationship and magnitude is not consistent across all sample countries. In Switzerland, there is significantly positive between stock price growth and GDP growth. 1% increase of GDP in T+3 periods will cause 0.025% rise of share price in T period.

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