INVESTMENT DECISION MAKING WITH RESPECT TO THE INFLATION RATE AND THE TAX RATE

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Abstract

Investment decision making is one of the most important activities in the industrial company. New, not widespread techniques provide abnormal rates of returns, but more their idiosyncratic risk is high. That is why the systematic risk is driven with "an old obsolete" wide spread technique of manufacturing. In these consequences it is useless to improve modern techniques immediately. The investment decision making is also dependent on the rate of physical capital taxation and the expected inflation. More the stimulation of modern investment comes from the support via tax savings or due to low nominal interest rate (which means low inflation rate). It is also important to say that the innovation leaders in investment have taken advantage in their business. This is said to by the essential driver for strategic management thinking. In this article we provide the empirical evidence of presented topic in the Czech Republic for last period. Concretely we present the interdependence between the firm´s value and the technological progress in the data sample of the Czech Republic. In the end, need to say that in crisis it is hard to enforce more investment targets in contrary with the managerial benefits or dividends trends.

Key words: Investment Bubbles, strategic cost planning, idiosyncratic risk, Sollow residuals

JEL Code: G47, M21

Introduction

In the most modern macroeconomic approaches, there is highlighted the interdependency between the real economy and financial sector (for instance in Wickens, 2012). This interdependency is widely tested on the data sample of various financial time series in many countries. In the Czech Republic it is the case of FOREX market in Pošta (2012). The original risk premium formula deducted from the conclusion of C-CAPM model or CAPM model is according to the empirical analysis weakened. The Capital Asset Pricing Model (CAPM) predicts that, on average, firms with higher risk can be expected to yield higher returns than firms or assets with lower risk (Brealey et al., 2012). The potential solution is in the involvement of more real economy coefficient, for instance the variable representing the technological progress. We start our analysis in the Pastor and Veronesi (2006) technological shock explanation, under which we deduce optimal investment decision making. This is all built in consistency with the goal to maximize the firm value. The firm value represents the value of index PX the index of Prague stock exchange market. More we discuss the solution in the surroundings of the varying inflation rate and uncertainty about the tax rates.

1 Empirical evidence of the FOREX market behavior

The dependency between real and financial economy is viewed under the consumption based CAPM model. Its brief conclusion is that the risk premium of the particular asset is driven under the covariance between its yields and the consumption index behavior. When there is an option to hedge the decrease in consumption with the ownership of the analyzed financial asset then the risk premium is higher. Empirical evidence (Makovský, 2016) is showing the falsification of the presented hypothesis in the Czech FOREX market. In Makovský (2014), he provides the explanation of the problem with the existence of "Peso problem" or problems connected with the "Learning from expectations deviation" and "the existence of bubbles in the financial market". In this article we are interested in the bubbles on the speculative assets. For instance the behavior of speculators and arbitrageurs is explained in the model of Delong (1988). In comparison with the previous the Pastor and Veronesi model is connected with the technological bubbles explains the existence of bubbles with process of learning.

According to previous for the Czech Rep. time series he provide the formula No. 1.

$$E_t(\Delta s_{t+1}) = -0{,}33 f_t \; - 46{,}31 \operatorname{cov}_t(\Delta c_{t+1}, \Delta s_{t+1}) + -40{,}017 \operatorname{cov}_t(\pi_{t+1}, \Delta c_{t+1}), \qquad (1)$$

Where $E_t(\Delta s_{t+1})$ is the expected value of the spot exchange rate growth (rational expectations), f_t is the forward rate, cov_t is the symbol for the covariance, Δc_{t+1} is the growth of consumption and the π_{t+1} is the future value of inflation rate.

All the regression coefficients are falsified according to their p-values. The only verified coefficient is the forward rate (but with the minus value). The falsification is explained with the time volatile risk premium and the very negative value of the coefficient of the risk aversion.

2 Technological bubbles and their impact to the financial assets

Pastor and Veronesi (2006) present the model which solves the friction on the financial markets. They present the technological shocks as the main reason. Even when we assume the fully rational economic agents we assume the existence of friction. The model reasonably fits to the internet bubble appeared in the late 90ties.

In the simplest view, model divides the economy into two parts – the old economy with old techniques of manufacturing and the mass production and the new economy which is in presence unknown and not widely used. The new economy provides higher yield rate but is more risky and the risk itself is idiosyncratic. The systematic risk is driven with the old economy. Need to say that in our further analysis we assume the value of the PX index rate of return as the growth rate of the value of the firm. Assets are commonly purchased to serve for a relatively longer period, it is not unusual to utilize asset several times longer than the asset's normal life.

When the new technology succeeds in real practice, then this is accepted in the old economy. But more financial markets evaluate its risk as the systematic risk. The "cash flow" effect represents increase of future yields when using the new technology. The risk is very volatile so that the early absorption of new technology could be negative. After some time "the cash flow" effect is strengthened with the discount rate effect. The discount rate effect means that the higher probability of new technology absorption increases the stochastic discount factor. This evolution motivates anyone to restructure the old economy.

Pastor and Veronesi (2006), they provide simulations explaining the technological internet bubble. Effect "cash flow" and the "discount rate effect" fully appeared in the prices and yields of the financial assets. We lagged the technological shock of four years. In this four years yields in the old economy decrease and yields in the new economy increases. After four years the economy yields increase in both of the parts in the economy. Presented conclusions

were further confirmed in the evolution of NASDAQ in consequence of the evolution of NYSE.

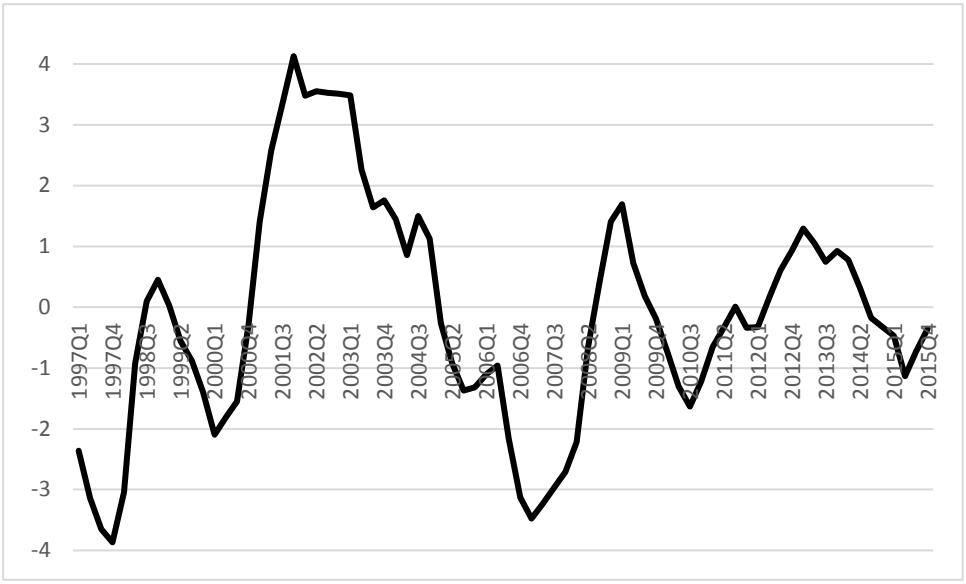
3 Empirical analysis in the Czech Republic

Although we are able to use variety of the innovation indices we have better to calculate the Sollow residuals. These indicators represent the whole economy and in consequence of our strategic target point in this article this is useful. Sollow residuals are calculated according to the following formula:

$$y_t = \psi_t + w^* l_t + (1-w)k_t, \tag{2}$$

Where y_t is the rate of growth of nominal GDP, ψ_t is the Sollow residuum in particular year, w is the deal of labor force to the nominal GDP, l_t is the growth rate of labor force and the k_t is the growth rate of physical capital (gross fixed capital). Then the *(1-w)* is the deal of capital to nominal GDP. All original data were achieved from the database of the Czech Statistical Office except for the time series of the index PX. It is gained from the database of the Czech Stock Exchange in Prague. The nominal GDP quarterly and the rate inflation (moving average) quarterly we gained the growth rate of real GDP. The *k* - coefficient the rate of growth of the gross fixed capital and the *l* –coefficient is the rate of growth of employees amount calculated according working hours. The *w* – deal is gained from the income method of GDP. We avoid seasonality away in assistance with the Hodrick-Prescott filter. The evolution of Sollow residuals is on the figure 1.

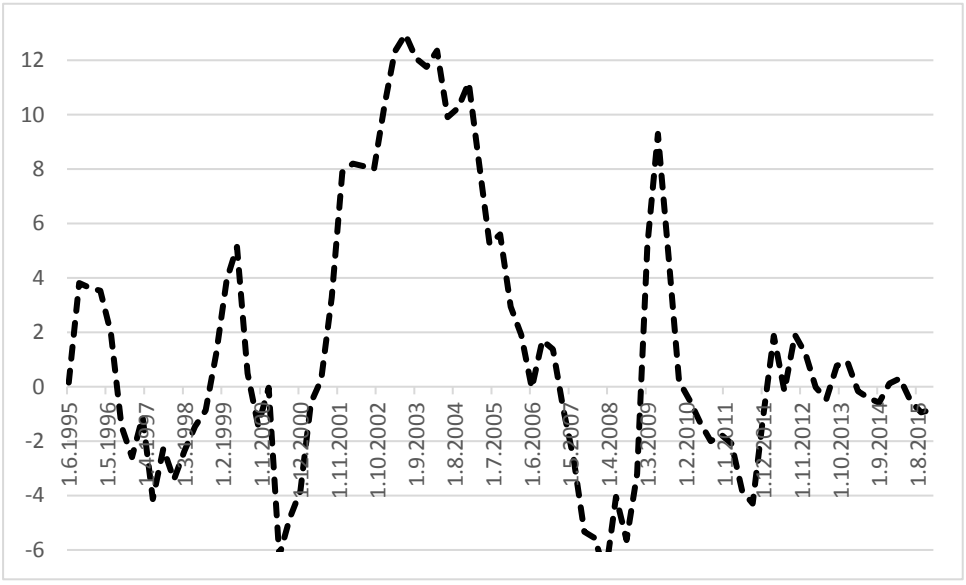
Fig. 1: Sollow residuals in time period 1995-2015 (%) – the case of the Czech Republic



Source: own calculation based on the data from the CZO (the Czech Statistical Office)

The Fig. 2 demonstrates the evolution of the index PX. It is the average rate of return in the Czech stock exchange market quarterly in the period between 1995 and 2015. Technically again we utilized quarterly moving averages transformed in assistance with the Hodrick-Prescott filter.

Fig. 2: PX index rate of return 1995-2015 (%) – the case of the Czech Republic



Source: own calculation based on the data from the CZO (the Czech Statistical Office)

Both time series analyzed contain serial autocorrelation according to values of autocorrelation function and PACF function. This problem disappeared when we modify both time series into first differences. Finally we explain the regression analysis output. We explain the evolution of index PX in dependence on the "Sollow" residuals. We assumed that the presented conclusion speaks about the firm value in the Czech Republic evolution in dependence on the technological progress.

Tab. 1: Regression of firm value to technological progress in the Czech Republic 1995 to 2015

	vPX=c(1)+c(2)*vSoll	**vPX=c(1)+c(2)*vSoll(-12)**	**vSoll =c(1)+c(2)* vPX**
C(1)	-0,000178 (0,9457)	-0,000547 (0,8493)	0,026522 (0,7318)
C(2)	+0,007916 (0,0428)	0,00810 (0,0480)	6,951651 (0,0428)
DW statistics	1,721080	1,386390	0,957639
Prob. (F-statistics)	0,042780	0,047994	0,042780

Source: own calculation in the Eviews

Here in the previous Tab. 1we see the conclusions. All presented alternatives refuse the constant in the regression. More the linear coefficient is according to p-values verified in all the alternatives. These alternatives for analysis are the linear regression not delayed, delayed linear regression by three years (12 quarters) and the reversed regression. We analyzed many other delayed linear regression. The three years of delay gave the best results of many statistical tests.

Finally the dependency of firm value on the three years delayed technological progress is confirmed. The coefficient has the value 0,008. This means that a one percent increase of technological progress growth leads to 0,008 percent increase of firm value in the three years in future. This conclusion is given among the data sample of the Czech Republic from 1995 to 2015.Here we see suitable values of the F-statistics and the DW-statistics. More we see that the not delayed linear regression provides similar solution. A very important fact is suitable no existence of auto correlated residuals.

In the end we have made the similar analysis in the FOREX case. Here we have weakened the influence of delay in the technological progress in the Czech data sample. Need to summarize. We verified the influence of the technological progress to the future firm value in the sample of the dataset in the Czech Republic. The optimal delay is the three years delay but the immediate impact is also verified.

New technologies are accepted under the decision making for the long run period. Actual trends in R&D are the knowledge networks and „Key Enabling Technologies“ (KET). KET are technology knowledge system domains. We can generate product innovations of the production processes and their services for instance nanotechnology, microelectronics, industry biotechnologies and advanced production technologies.

4 Investment appraisal under inflation and taxation

This chapter is focused on microeconomics aspects of the real companies. The essential factor of inflation is not enough involved in the analysis of investment decision making and investment opportunity returns calculations. The inflation is an average increase in prices of all goods and services in particular economy for the period. Inflation is measured in the rate of inflation which is the percentage change in prices increase. In the industry we used the percentage change in prices of specific basket of industry production prices.

More we differentiate the general inflation and the specific inflation. The Specific inflation is preferable for managerial investment evaluation. It is the indicator which adapts the general inflation to specific condition of investment type. It is inflation influences important cost and benefits items in the investment project. These are commonly included in the inflation clauses in the contracts. Petřík (2009) mentions important units for specific inflation.

- The price of production devices and machines, the price of transportation machines;
- Labor costs included social and medical insurance (total payroll);
- Managerial benefits;
- The inventories price and fuel;
- The price of logistic, IT and telecommunication services and Facility services;
- Real Estates prices and Construction;
- External services (e.g. tax and accounting consulting, law and banking consultancy, insurance, auditing).

Professional investment project contains the analysis of inflation items in order to provide sophisticated decision making for perfect estimation of inflation in the future. More we decide whether the inflation is synchronized or not.

Synchronized inflation assumes that cost and benefit items evolves in the same way and in the same rate. Here the total profit is the same as before the prices change. Unfortunately there appears the non-synchronized inflation which harms practical business a lot. The costs increase faster than revenues. The revenues stagnate and sometimes decrease. Finally the investment effect decreases.

The other factor of decision making is the impact of taxes. The tax rate (profit tax rate, the asset tax depreciation) must be involved in the investment decision making and prediction. Practically we have to calculate the net after tax incremental cash flows, of each particular investment project. According to Petřík (2009) the main tax impacts to investment evaluation are follows:

- corporate tax;
- writing down allowances – WDA;
- deferred taxation;
- temporary discounts thank to investment incentives;
- value added tax – VAT;
- tax provisions creation according to the law;
- tax reliefs for legal entities according to specific law (e.g. discounts for employed disabled people).

Conclusion

In this article we are interested in investment decision making with respect to the inflation rate and tax rate. We have shown that for last twenty years in the Czech Republic the firm value is dependent on the previous technological progress in a suitable p – value of statistical significance. We verified the three years lagged influence and more immediate impact in the data sample of the Czech time series variable.

More we verify the regression coefficient. The meaning is that a one percent increase of technological progress growth leads to 0,008 percent increase of firm value. This is great message for the policy makers in creating their effective economy policy. The impact of tax rate for investment is clear. Not even in the times of crisis there is no need to increase tax for capital technology and other kind of technologies. So we need to support lower taxing of any type of know-how, decrease the time amortization and support open innovations platform. In the view of inflation we did the analysis without inflation influence. The inflation rate was augmented in calculating the real GDP from nominal GDP.

Both inflation and tax factors are very important factors for investment technology project evaluation. In conclusion we highlight that taxes and inflation are factors, whose omitting in the investment decision making and investment prediction harms the future firms value a lot. This could even lead to the firm liquidation or insolvency. Besides, the process of strategic decision making is often not only based on experience, but also on intuition or guessing. Formal written plans are widely considered better than informal, unwritten plans because they foster critical thinking, group decision making, and internal as well as external communication, and furthermore serve as a control mechanism. Everyone who wants to lead his business in the going concern way must take into account all the factors.

Acknowledgment

This article was written as part of the Student Grant Competition, project no. SGS FES 2016 023 Economic and social development in private and public sector. The authors thank for financial support.

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