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Revisiting the accelerator principle in a world of uncertainty: Some empirical evidence☆

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ABSTRACT

This contribution builds on the accelerator model to produce an investment function in which employment and households' investment are used as proxies for economic activity. This analysis identifies a positive correlation between corporate investment in fixed assets and households' investment in dwellings. Using a panel of 11 OECD countries for the period 1970–2010, the results also confirm that oil prices and interest rates may dampen firms' investment in fixed assets. An interesting feature of this investment function is that it accounts for uncertainty.

1. Introduction

The aim of this paper is to produce an investment function based on the accelerator principle that includes employment and the rate of growth of investment in dwellings to approximate the level of economic activity. Our model also focuses on the role of oil prices in the current economic situation where energy efficiency and renewable energy are key elements in the transition to a low-carbon economy. Additionally, this investment function also examines whether there is some evidence of interest rates driving firms' investment.

This paper builds on the approach introduced by Lavoie et al. (2004) to account for uncertainty and conventions in the explanation of capital accumulation. Specifically, the current piece of research employs the approach presented in Arestis et al. (2012) to include uncertainty. Although both approaches employ the Hodrick–Prescott filter (Hodrick and Prescott, 1980) to approximate the 'conventional' knowledge, there are differences in the way in which the conventional level of the variables is included within the model.[1] In particular, this contribution moves beyond the Arestis et al. (2012) findings by exploring other proxies of the level of the economic activity, which have been ignored in the existing literature, such as employment and dwelling investment. Traditionally, capacity utilisation, which gives an indication of the volume of capital stock that is used in the economy, has been utilised to approximate the level of economic activity. However, this variable only refers to one factor of production, i.e. capital. In this context, an interesting issue to be explored is whether the existence of 'idle' labour, i.e. unemployment, could act as a constraint to investment. In addition, this paper also examines whether the activity of the housing market could be another driver of the accumulation process. This is so in view of the study by Leamer (2007), which suggests that housing cycles lead to business cycles. For the purpose of this paper, an alternative discussion of the role of oil prices in the investment decision is also provided, i.e. oil is treated as another productive factor rather than a proxy for political uncertainty.

Subsequently our theoretical proposition is investigated empirically in a sample of 11 OECD economies over the period 1970–2010. Specifically we employ the Within-Group estimation to model fixed effects,

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[1] More specifically, in Arestis et al. (2012) uncertainty is included in the model by calculating the deviation between the current level of the relevant variable and its conventional level, while in Lavoie et al. (2004) conventional levels are considered as a variable itself or use as a component of some explanatory variables.

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GLS to estimate random effects, the Panel Corrected Standard Errors technique (PCSE) and fixed effects (within) estimations with the Driscoll and Kraay standard errors.

The remainder of this contribution is organised as follows. Section 2 presents the investment function that we propose for the purpose of this contribution. Section 3 focuses on the econometric techniques utilised. Section 4 presents the econometric results, while Section 5 interprets and discusses further the derived estimates. Section 6 summarises and concludes.

2. The investment function

2.1. Revisiting the accelerator model

The starting point of this contribution is the traditional accelerator model of investment, which is presented in Eq. (1):

$$I = \beta_0 + \mu(Y_t - Y_{t-1}) = \beta_0 + \mu(\Delta Y_t) \quad (1)$$

where I stands for investment in fixed capital assets, Y is output, and μ represents the ratio of capital-to-output.

It is well-known that the accelerator principle assumes that firms undertake new investment projects to adapt their productive capacity to a new situation where they need to satisfy higher effective demand. Specifically, the flexible accelerator model improves the basic accelerator principle by considering the existence of an optimal or desired capital-to-output ratio (Koyck, 1954). Despite the importance of this principle, several criticisms have been pointed out by the existing literature such as its asymmetrical behaviour and its mechanicism.[2] Further criticisms are its inability to account for technical change and expectations regarding future demand.

Eq. (1) can be transformed by expressing the variables as a ratio to output.[3] As a result, the endogenous variable of our model is defined as the investment-to-output ratio, $\frac{I}{Y}$, instead of the traditional rate of accumulation, which is defined as $\frac{I}{K}$(see also Lee et al., 2012). This transformation has interesting properties in terms of its interpretation. More specifically, the coefficients, which will be estimated to test our testable hypothesis will be η times those that we could find in the case of considering the rate of accumulation as the endogenous variable of this flexible accelerator model (Dehn, 2000, also adopts a similar approach). The resulting model is shown in Eq. (2):

$$\frac{I}{Y} = \mu_0 + \mu_1 \hat{Y} \quad (2)$$

where $\hat{Y}$ captures the rate of growth of output, and the other symbols have the same meaning as in Eq. (1).

In general terms, investment decisions are taken in a context of uncertainty, which enhances the role of the animal spirits. Uncertainty can emanate from several sources such as economic factors, political regimes, environment, etc. In this context, agents' difficulties to form accurate expectations about the future have been emphasised by the financial turbulence, which started in August 2007 and led to the 'great recession' (The Economist, 2012). Uncertainty is particularly relevant in the case of investment in fixed capital assets, where there are high sunk costs. The irreversibility of the investment decision results in the value of 'waiting' to improve the imperfect and limited information that businessmen have when they embark on a new project. This element becomes crucial in those cases where the project involves the adoption of pioneering technologies; for example, investment in renewable energy, or when there is room for policy makers to tackle market failures.

In particular, our model assigns an important role to the acceleration principle, which accounts for expectations about future aggregate demand, $\hat{Y}$, which are proxied by the rate of growth of effective demand in the recent past. However, this continuity just creates the general context where the animal spirits can act spontaneously. The animal spirits *à la* Keynes are captured in Eq. (2) by means of the 'intercept', μ_0, as discussed extensively in Dutt (1984).

In this context, two different proxies for the level of economic activity are included in order to improve businessmen' knowledge of the current stage of the economy; these are the rate of employment and the volume of households' investment. In this context, a relevant element that needs to be discussed is the role of conventions.[4] From a Keynesian view conventions are understood as a mechanism to help individuals to define their expectations in a non-ergodic world where mathematical and statistical analyses are not the ultimate 'tool' to help individuals to take their economic decisions. In this context, it is more realistic to assume that this decision rule or mechanism will be 'connected' to the evolution of the economy in the recent past. The notion of self-fulfilling prophecies (Merton, 1968), which has been extensively applied by Shiller (2007) in the context of housing economics, is also applicable to this discussion and provides some justification for this assumption.

In our analysis, the construction of a proxy for conventions is based on the Hodrick–Prescott filter (Hodrick and Prescott, 1980).[5] This approach is compatible with the French School view (Dequech, 2009, 2011) in the sense that this knowledge is available and 'shared' by all individuals since it is based on the past and does not include personal judgements. Additionally, this filter, which allows the trend component to vary through time, also presents the dynamic behaviour that is implicit in the notion of conventions as highlighted by Dequech (2011). This can be interpreted as a reflection of how individuals need to revise continuously their expectations.

2.2. Alternative proxies for the level of economic activity

We assume an economy with 3 productive factors: labour, capital, and an energy commodity. The inclusion of labour in the productive process suggests the construction of an indicator for the level of economic activity, based on the proportion of the employed population. In this context, businessmen's investment plans will be less ambitious when they have to cope with a decline in demand. The evolution of the share of potential workers, who are currently employed, requires further analysis. Specifically, workers play a double role in the economy, i.e. they are a source of demand and also a productive factor, whose cost

[2] It exhibits an asymmetric behaviour, due to the fact that this principle explains better investment decisions where the disequilibrium between the desired capital-to-output ratio and effective capital-to-output ratio is caused by a shortage of installed capital rather than a surplus of capital.

[3] This transformation is helpful to cope with the lack of consistent and homogeneous data on private capital stock.

[4] See, also, De Melo Modenesi et al. (2013) for further discussion of alternative views of the notion of 'convention'. De Melo Modenesi et al. (op. cit.) concentrate on the Keynesian and French approaches. More specifically, the Keynesian view (Keynes, 1936; Davidson, 2002) identifies conventions with a 'mechanism' that individuals can use to deal with the existence of uncertainty in their economic decision-making process. The French School (Dequech, 2009) understands conventions as a common knowledge, which emerges in response to uncertainty.

[5] The Hodrick–Prescott filter (Hodrick and Prescott, 1980) permits the researcher to decompose time series into their trend and cyclical components. More specifically, the Hodrick–Prescott filter (op. cit.) isolates the trend and the cyclical components of a particular time series; and works by minimising the square of the deviations from the trend and by penalising changes in the acceleration of the trend of the time series. In particular, we assume that businessmen's expectations, i.e. businessmen's conventional knowledge, are based on the trends followed by the variables in the past.