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Advertising as a predictor of investment

Kari S. Fridriksson [a], Gylfi Zoega [a,b,*]

[a] Department of Economics, University of Iceland, 101 Reykjavik, Iceland

[b] Department of Economics, Birkbeck College, University of London, Malet Street, London WC1E 7HX, United Kingdom

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ABSTRACT

The collapse of Iceland's financial system in October 2008 is used as a natural experiment to test whether advertising decisions have a forward-looking component. The results show that changes in the volume of advertisements precede changes in investment.

1. Introduction

Advertising aimed at capturing market share has an investment dimension. In this paper we use this observation to test whether the volume of advertising could serve as a leading indicator for gross capital formation. Our data is taken from idyllic sparsely-populated Iceland that became a symbol of the current global financial crisis when its banking system collapsed in October 2008, only a couple of weeks after the failure of Lehman Brothers. In particular, we measure the volume of advertising and relate it to macroeconomic data to test whether firms reduced advertising in the months preceding the collapse. In addition, by looking at data over a longer period from January 2001 until October 2010 we will map the cyclical behaviour of advertisement expenditures and relate them to the cyclical behaviour of investment.

Our idea to use the volume of advertising to predict the volume of investment is rooted in the customer market model of Phelps and Winter (1970) and Okun (1981). In this model firms and their customers form long-run relationships when customers become attached to a particular firm because of imperfect information about prices charged by rival firms. In this setting a firm's market share becomes an asset and advertising constitutes investment in market share. There are two reasons why news about changes in current and future profits may show up first in the advertising data. First, our measure of advertising taken from newspapers can be collected at a higher frequency than the national accounts data. Second, a decision to increase advertising outlays can be expected to be implemented quicker than the decision to invest in new capital.

We are not the first to use the volume of newspapers as a measure of advertising. Rotschild (1942) complains about the lack of statistics on the volume of advertising and uses a measure of the space devoted to advertisements in London newspapers from 1910 to 1932.[1] The space devoted to advertisements reveals that advertising expenditures fluctuated with investment spending in the economy. There is a peak in the boom years of 1920 and 1928 and a marked trough in the subsequent slump years. Rotschild cites other writers that show how profits and advertising expand and contract together (see, amongst others, Vaughan (1928) and Wagner (1941)).[2]

Below we first model advertising as investment in market share and then use data from Iceland in the subsequent section

* Corresponding author at: Department of Economics, University of Iceland, 101 Reykjavik, Iceland. Tel.: +354 525 5239; fax: +354 552 6806.
E-mail address: gz@hi.is (G. Zoega).

[1] One measure is the "Average percentage increase in display advertising space in eight London daily newspapers", another is "Average changes in display advertising space in five leading provincial morning papers", and the third is "Percentage increase in volume of display advertising space in four London daily newspapers".

[2] Simon's (1970) book on advertising economics surveyed available studies and established a link between advertising and the business cycle.

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to test whether the volume of advertising prior to the collapse of the country's financial system reveals expectations about the impending shock. In the last section we describe results from other countries.

2. A model of advertising expenditures

Following Stigler and Becker (1977) and Kotowitz and Mathewson (1979)[3] we assume that utility depends on two-dimensional quality where advertising affects one of the dimensions – such as the associated social status – while the other dimension can be effortlessly observed. We assume that the dimension affected by advertising affects consumers' choice of a product but not the volume bought by each customer. It follows that advertising is a way of attracting new customers while existing customers may be tempted to leave because of advertising by rival firms. The flow of customers N to the representative firm is then described by the following equation

$$\dot{N} = g(a)\left(\overline{N} - N\right) - Lg\left(a^*\right)N \tag{1}$$

where $\overline{N}$ denotes the total number of consumers – or potential customers – in a market, N is the number of customers of the representative firm, a is the volume of advertising by the representative firm, a^* is the volume of advertising by rival firms and L is the number of rival firms. We assume that there are positive but diminishing returns to advertising so that $g'(a) > 0$ and $g''(a) < 0$. The equation implies that the inflow of customers is a positive function of the volume of own advertising, a negative function of the volume of advertising by others and a negative function of own market share $N/\overline{N}$.[4] In a steady state we find that the size of own market share relative to that of others is

$$\frac{N}{\overline{N} - N} = \frac{g(a)}{Lg\left(a^*\right)} \tag{2}$$

which is equal to $1/L$ in a symmetric equilibrium where $a = a^*$. Thus the share of the representative firm is rising in its own advertising relative to that of rival firms and decreasing in the number of rival firms.

The representative firm maximises the present discounted value of profits, where current profits are defined as

$$\pi = Nd\left(p; \Lambda\right)(p - c) - p_a a \tag{3}$$

and p is the price of unit of output, $d(p; \Lambda)$ is a downward sloping demand curve with shift parameter Λ and $d'(p; \Lambda) < 0$, c is the constant cost of production per unit produced and p_a is the price of advertising. Defining the shadow price of a customer by q we derive the Pontryagin conditions. The first condition sets the marginal benefit of advertising equal to the marginal cost

$$qg'(a)\left(\overline{N} - N\right) = p_a. \tag{4}$$

The left-hand side denotes the marginal benefit of advertising and the right-hand side denotes the marginal cost. The marginal benefit is increasing in the shadow price of a customer q, the marginal effectiveness of advertising in attracting new customers $g'(a)$ and the number of consumers not yet attached to the representative firm. The marginal cost consists of the price of advertising p_a. The second equation determines the optimal path for the shadow price q

$$r = \frac{\dot{q}}{q} - g(a) - Lg\left(a^*\right) + \frac{d\left(p; \Lambda\right)(p - c)}{q}. \tag{5}$$

Combining Eqs. (4) and (5) gives an Euler equation for the volume of advertising:

$$\dot{a} = -\left(\frac{g'(a)}{g''(a)}\right)\left[r - \frac{d\left(p; \Lambda\right)(p - c)\, g'(a)\left(\overline{N} - N\right)}{p_a} + \left(g(a) + Lg\left(a^*\right)\right)\right]. \tag{6}$$

Changes in the volume of advertising a over time depend on a comparison of the required rate of return r and the rate of return on a customer which is captured by the last two terms in the square bracket. The second term measures the profits from selling to a new customer divided by the marginal price of advertising. There is also a loss from having a customer that is described by the third term. This is the gradual erosion of market share caused by the advertising of other firms. Eqs. (1) and (6) define a system of two variables that can be solved together. The phase diagram for the dynamic system is shown in Fig. 1.

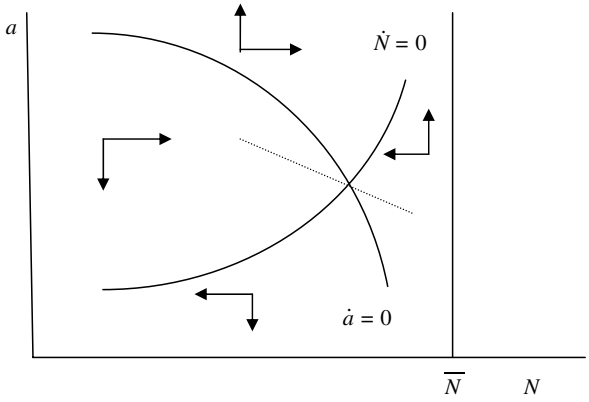

Fig. 1. Model dynamics.

The expectation of a collapse of a financial system reduces expected demand per customer by changing the value of the shift parameter Λ. This makes the $\dot{a} = 0$ schedule gradually shift downward and in a symmetric equilibrium the $\dot{N} = 0$ schedule also gradually shifts downward because of a falling level of a^*. These shifts make the volume of advertising a (as well as a^*) gradually fall until the time that customers reduce their demand and the $\dot{a} = 0$ schedule meets the $\dot{N} = 0$ schedule at a new equilibrium point. See Fig. 2.

We will now turn to the economic collapse in Iceland in 2008 and describe how the volume of advertising changed during the boom and the economic turbulence that preceded the collapse.

3. Events

Iceland experienced a credit-driven boom between 2004 and 2007, generated by an inflow of foreign capital. Domestic credit grew annually by 20% or more per year, output growth ranged between 4.6% and 7.7%, fuelled by growing investment and consumption, the real exchange rate rose and the current account deficit ranged between 9.8% and 23.8%.

The credit-driven boom came to an abrupt halt in the fall of 2008 when the country's banking system collapsed triggering a perfect storm of a currency crisis, financial crisis, and a contraction of the real economy. See Benediktsdottir et al. (2011) on the crisis.

[3] See Butters (1977), Grossman and Shapiro (1984) and Stegeman (1991) for the alternative setup where advertising is purely informative. See Bagwell (2001) for a survey of the economics of advertising.

[4] In a slightly different setup, Sibly (1995) models advertising as affecting the rate of flow of customers responding to price differences between firms.