

Assessing Thai Entrepreneur Performance: Steps Toward a New Venture Production Function

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ABSTRACT

This paper describes the development and estimation of a New Venture Production Function (NVPF). It focuses on technical aspects of a project undertaken as a research collaboration between business economists and educators from the Auckland University of Technology (AUT) and The University of the Thai Chamber of Commerce (UTCC) investigating the attributes of successful Thai SME entrepreneurs in post currency crisis Thailand. The motivation for the innovation described in the paper is the questionable reliability of performance data collected by survey questions probing performance in a population of entrepreneurs. The NVPF is configured as a simple Cobb-Douglas specification estimated in first differences. The model estimation is based in a convenience sub-sample of 75 new venture entrepreneurs taken from a total sample of

537 Thai SME entrepreneurs surveyed by UTCC graduate students in October 2000. Hypothesis testing shows that the relationships predicted by theory between annual changes to new venture output and financial and human capital are evident in this population of entrepreneurs. This analytic convenience enables analysis of survey questions couched terms of percentage change of sales. This measure of Thai SME performance *is* designed to circumvent potential weaknesses in data provided by survey respondents.

Introduction

In this paper the development and estimation of a New Venture Production Function (NVPF) is outlined and then applied to a sample of Thai new venture firms. NVPF provides the basis of an analytical model that the authors have developed to provide insights into the role of attributes most closely related to entrepreneur success following the East Asian financial and economic crisis that began in July 1997. This paper, therefore, focuses on technical aspects of a project undertaken by a research collaboration of business economists and educators from the Economics Academic Group and Centre for Entrepreneurship Development and Research, Auckland University of Technology, New Zealand with a researcher from the University of the Thai Chamber of Commerce, Thailand.

The motivation for this study was to develop an analytical and empirical model that could be utilised to analyse factors influencing the success of new ventures. The interrelationship between three important elements of the modern economy provides the rationale for this research; firstly, the recognition that the private sector remains the main mechanism for economic growth in an economy (Schumpeter 1934, McClelland 1961, Kirchoff 1991), secondly, the fact that many new ventures fail within the first year or two of start-up (Bruno, Leidecker and Harder 1987, Karakaya and Kobu 1994, Kuratko and Hodgetts 2001), and thirdly, the negative impact of a hostile business environment on firms (Potter 1991, 1994, Perry, Zapalska and Mondal 2000). The NVPF is configured as a simple Cobb-Douglas specification. The key feature of the model specification is that is estimated in first differences as opposed to levels.

This model formulation is intended to assist in the data collection phase. The basis of the innovation is the questionable reliability of performance data collected by survey questions probing performance in a population of entrepreneurs. We felt that entrepreneurs were more likely to offer accurate responses to questions relating to success of their ventures if questions were framed in terms of annual percentage changes rather than in levels. The NVPF specification, therefore, is specified in percentage changes.

The model estimation is based in a convenience sub-sample of 75 new venture entrepreneurs taken from a total sample of 537 Thai SME entrepreneurs surveyed by UTCC graduate students in December 2000. Hypothesis testing shows that the relationships predicted by theory between output and financial and human capital are evident when the model is estimated over annual changes in the model variables. This signals a role for the NVPF in the wider production function the research collaboration has developed to model success factors in Thai SME proprietors.

The layout of the paper is as follows: The next section, "Model Development" describes the mathematical formulation of the model and its wider theoretical basis. The section "Estimation" describes the data and the outcomes of estimation of the NVPF. This is followed by a discussion of the outcomes and a brief conclusion which summarise the outcomes and points to further application of this model in our overall research project.

Model Development

This section describes the development of an alternate specification of the Cobb Douglas production function for application as an econometric core whose task is to control for financial and human capital in an extended model of new venture success. The Cobb Douglas production function is a specific case of the more general model which proposes that output in period t (Y_t) is a function of capital (K_t) and labour inputs L_t and a vector other factors (J_t):

$$Y_t = f(K_t, L_t, J_t)$$

In the Cobb Douglas specification which connects only capital and labour inputs with output, the variables are related in a multiplicative, non-linear manner according to the map:

$$Y_t = k K^a L^{\beta}$$

a and β are exponents describing the relationship between output and capital and labour respectively, and k is a constant. In stochastic terms this relationship becomes:

$$Y_t = k K^a L^{\beta} e^{u_i} \quad (\text{Gujurati, 1998})$$

To allow estimation by ordinary least squares the model needs to be log transformed so that the specification of the parameters is linear:

$$\ln Y_t = \ln k + \alpha \ln K_t + \beta \ln L_t + u_i$$

If this relationship holds at time t , then it does also at time $t-1$.

$$\begin{aligned} \ln Y_{t-1} &= \ln k + \alpha \ln K_{t-1} + \beta \ln L_{t-1} + u_{i-1} \\ \Delta Y_t &= Y_t - Y_{t-1} \end{aligned}$$

Allowing

Then the model we will estimate is,

$$\ln \Delta Y_t = \gamma + \alpha \ln \Delta K_t + \beta \ln \Delta L_t + u_i$$

where

$$\gamma = \ln k$$

In order to verify that this relationship holds in our data, the following hypotheses are advanced for testing:

$$H_0 : \alpha = 0$$

$$H_A : \alpha \neq 0$$

$$H_0 : \beta = 0$$

$$H_A : \beta \neq 0$$

and,

Should we be able to demonstrate the statistical significance of these coefficients we will have shown that the Cobb Douglas formulation holds for our data set as expected. Consequently we will be able to employ the

specification as an anchor in our wider econometric model of new venture success to control for financial and human capital.

Estimation

Our data consists of a portion of the survey responses by 537 Thai SME entrepreneurs collected by UTCC graduate students in October 2000. This portion of the responses have in common is that respondents directly signalled that their enterprises were in start up mode characterised by product development and design, securing of financial resources, developing a market, the absence of formal procedures in the company and with most employees having technical tasks (Kazanjian 1988, Zapalska and Perry 2000).

Amongst a raft of questions derived from the new venture and entrepreneurship literature were questions which asked the respondents to give an indication in percentage terms of the annual change to sales, net assets, and employees for their enterprises. This information forms the basis of the estimation of the NVPF described above. Of the 75 entrepreneurs, 65% showed an increase in sales in the previous twelve months, 81% showed an increase in net assets in the previous twelve months and 80% showed an increase in employment in the previous twelve months. Figure One describes the distribution of annual sales change measured as a percentage change from 1999 levels.

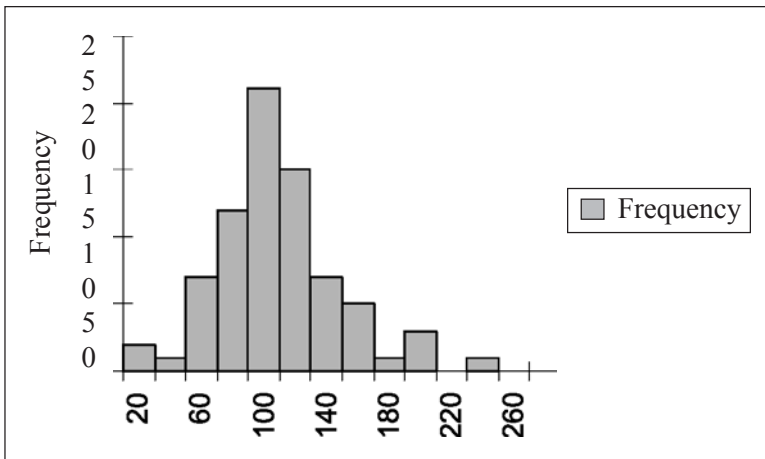


Figure One: Frequency Distribution: Annual Change in Sales

The new venture data was isolated from the wider data set of 537 by way of a dummy variable. The percentage change information for each of the three variables was transformed to index form with 100 equating to 0% change. This indexation was undertaken to facilitate log transformation of the variables.

These indices of change were then input to the Cobb Douglas formulation. The function was estimated by ordinary least squares using a heteroscedasticity consistent covariance matrix (White, 1996). Model misspecification was tested for by reporting the Durban-Watson (DW) statistic and the estimation output reports an F test that tests the proposition that the model explained none of the variation in the annual sales change index. The usual Rsq statistic reports the explanatory power of the model. Table One reports descriptive statistics of the model variables.

Table One: Descriptive Statistics

	0 sales	0 asset	0 emp
Mean	103.1657	104.0133	98.72
Standard Error	4.567854	3.75106	3.171299
Median	100	100	100
Mode	100	100	100
Standard Deviation	39.55877	32.48513	27.46426
Range	239	249	181
Minimum	1	1	1
Maximum	240	250	182

OLS estimation over 75 observations with the dependent variable log of sales the estimation used heteroscedasticity-consistent covariance matrix. The model R- square = 0.8142 and the adjusted R-square = 0.8091 suggests that the explanatory power of the model is high: only twenty per cent of the variation in annual change in sales is not explained by the model. The F test on the proposition that the model explained nothing yielded a P-value of 0.00 with 72 degrees of freedom. Table Two reports the estimation.

Table Two: Ordinary Least Squares Estimation

Variable	Estimated coefficient	t-statistic	p-value
0 Assets	0.3059	1.847	0.06
0 Employment	0.7099	4.18	0.00
Constant	-0.9575	0.14	

The Durbin-Watson = 1.7582 is potentially indicative of omitted variables. This is consistent with the initial model formulation which included the vector of entrepreneur attributes J_t , while the inevitable heteroscedasticity inherent in this kind of data is accounted for in the estimation algorithm. The coefficients may be interpreted as elasticities, the sample showing close to constant returns to scale, perhaps with a tendency toward increasing returns to scale. The t-ratios with accompanying p-values show the statistical significance of the coefficients on capital and labour. Alpha is significant at the 0.06%, beta at the 0.00% level of significance. As expected output is positively associated with capital and labour variables. Investment in financial capital has a greater per unit return than increasing the labour force at this stage of development, although it would be necessary to compare the monetary cost of a unit of labour and capital to confirm this. Figure Two reports the residuals from the estimation

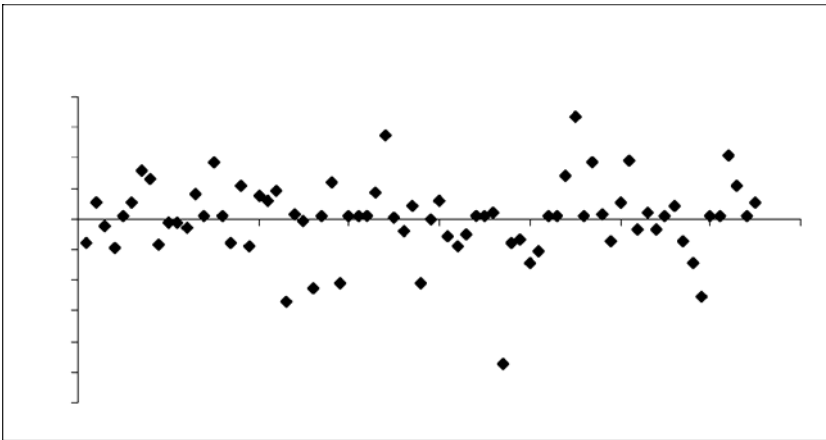


Figure Two: Residuals

Discussion and Conclusion

The OLS regression estimation reported above shows the strength of the theoretical precepts when applied to the data. Our model using change in annual sales takes account of 80% of the variation in sales with statistically significant coefficients. On the basis of this result we have adopted this first differences formulation of the Cobb- Douglas production function as the core or chassis of a model of new venture performance.

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