

MACROECONOMIC IMPACTS OF DERIVATIVE MARKETS

A Master's Thesis

by

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Economics

Bilkent University

Ankara

December 2006

To My Family

MACROECONOMIC IMPACTS OF DERIVATIVE MARKETS

The Institute of Economics and Social Sciences
of
Bilkent University

by

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In Partial Fulfillment of the Requirements for the Degree of
MASTER OF ARTS

in

THE DEPARTMENT OF ECONOMICS
BİLKENT UNIVERSITY
ANKARA

December 2006

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

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ABSTRACT

MACROECONOMIC IMPACTS OF DERIVATIVE MARKETS

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December 2006

There has been much debate over the effect of financial development on economic growth and well-being. A conclusion has not been reached yet; some of the works assert that the level of financial development leads to sounder macroeconomic conditions, whereas some others hold opposing views. Another line of literature concentrates on the relation between the level of existing uncertainty and the level of investment. There are again controversial conclusions reached regarding this relationship; some argue that the level of uncertainty has a negative effect on investment, whereas some argue that the correlation between these two variables is positive. In this paper, the assertions of these two different lines of the literature will be linked under a single heading, the derivative markets. This paper will analyze the effect of the existence and growth rate of the derivative market volume on the standard of living of individuals under the framework first constructed by Mankiw, Romer and Weil (1992).

Keywords: Derivative Markets, Economic Growth

ÖZET

TÜREV PİYASALARININ MAKROEKONOMİK ETKİLERİ

Polat, Mehtap Beyza

Yüksek Lisans, Ekonomi Bölümü

Tez Yöneticisi: Yard. Doç. Dr. Refet Gürkaynak

Aralık 2006

Finansal gelişmişliğin ekonomik büyüme üzerindeki etkileri literatürde sıkça tartışılmış bir konudur. Bu konuyla ilgili herhangi bir mutabakata varılamamıştır; kimi çalışmalar finansal gelişmişliğin daha sağlıklı makroekonomik sonuçlar doğurduğunu savunurken, diğer bazı çalışmalar bunun aksi görüşü benimsemektedirler. Diğer bir literatür ise var olan belirsizlik ile yapılan yatırım arasındaki ilişkiyi incelemektedir. Bu ilişki hakkında da karşıt görüşler mevcuttur; kimi çalışmalar artan belirsizliğin yatırım üzerinde olumsuz etkileri olduğunu iddia ederken, diğer bazı çalışmalar bu iki değişken arasındaki ilişkinin pozitif olduğu görüşünü savunmaktadır. Bu çalışma ile birlikte bu iki farklı literatürün bulguları tek bir başlık altında toplanabilecektir: türev piyasaları. Bu çalışma türev piyasalarının varlığı ve hacminin büyümesinin bireylerin yaşam standartları üzerindeki etkilerini, ilk kez Mankiw, Romer ve Weil (1992) tarafından oluşturulan çerçeve içerisinde inceleyecektir.

Anahtar Kelimeler: Türev Piyasaları, Ekonomik Büyüme

ACKNOWLEDGEMENTS

I would like to thank my honorable teacher Dr. Refet Gurkaynak for his guidance from the beginning to the end of this thesis. Without the invaluable comments he provided, I would not be able to complete this work.

I would also like to thank my honorable teacher Dr. Fatma Tařkın for the precious support she gave me throughout my whole graduate study.

I also want to thank my examining committee members Dr. Aslıhan Altay-Salih for her valuable comments.

I am also grateful to Banu Demir, Ozan Acar and Barıř Esmerok for their sincerity and support. I would not be able to overcome the hard times of my master studies without their friendship.

I would finally like to thank to my family for giving me an invaluable support from the beginning of the primary school to the end of this thesis.

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CHAPTER 1

INTRODUCTION

In 1911, Schumpeter argued that the services provided by financial intermediaries are crucial for economic development and well-being. Since then there has been much debate over this issue. This ongoing debate did not reach to a single conclusion, yet. Some of the works in the literature are in favor of this view, some others hold opposing claims. A common feature of all these works is that they take the financial system as composed of banks and the stock markets, only. Another line of literature deals with the relationship between the level of existing uncertainty and the level of investment. The conclusions reached regarding this relation are again quite controversial; some argue that the level of uncertainty has a negative effect on investment, whereas some contend that these two variables have a positive correlation.

In this paper, these two different lines of the literature will be linked under a single heading, the derivative markets. Derivative markets provide the service of risk management, which is one of the most important services of financial intermediaries. In other words, derivative markets enable the economic agents to hedge themselves

against the idiosyncratic risks they face. A single economic agent is not able to alter the risk existing in the market. However, by utilizing the services that derivative markets provide, s/he can reduce the unsystematic risk s/he will face and may thus reduce the uncertainty associated with the transactions s/he plans to conduct. If the correlation between uncertainty and the investment is negative, then this will end up with higher level of investment and consequently with sounder economic conditions. However, if this correlation is positive, then level of investment will be lower.

This paper will analyze the effect of the existence and growth rate of the derivative market volume on the standard of living of individuals under the framework first constructed by Mankiw, Romer and Weil (1992). The conclusions of this paper will provide some further evidence on the relation between finance and macroeconomics from a perspective different from the existing one and relate it to another important line of the literature, which is concerned with the investment-uncertainty relationship. In this paper, I do not aim to make any conclusions regarding the relation between the existence of derivative markets and the level of uncertainty. The reason why I refer to the literature on investment-uncertainty relationship is to clarify the motivation of this paper. The derivative markets enable the economic agents to reduce the unsystematic risk existent in the market and reduces the uncertainty in a way. Thus the correlation between the level of uncertainty and the level of investment, and thus the level of economic activity, makes derivative markets a relevant concept for economic growth. In other words, the investment uncertainty relation is the channel through which I make my main hypothesis that “derivative markets may have effects on economic growth”.

The organization of the paper is as follows; following section (Chapter 2) presents a very brief literature review on the finance-macroeconomics and the investment-uncertainty relations. Chapter 3 will introduce the data, methodology and the results of the empirical analysis will be presented. I will finally conclude the paper in Chapter 4.

CHAPTER 2

LITERATURE REVIEW

As stated before, this paper is associated with two distinct lines of the existing literature, the literature on the finance-macroeconomics relation and the literature on the investment-uncertainty relation. In this section of the paper, I will very briefly summarize these two lines of the literature.

Regarding the relationship between finance and macroeconomic conditions, there is a vast amount of work done. Financial development provides five major functions, which are (i) production of ex ante information about possible investments, (ii) monitoring of investments and implementation of corporate governance, (iii) trading, diversification, and management of risk, (iv) mobilization and pooling of savings, and (v) exchange of goods and services. (Levine, 2004) Derivative markets enable the economic agents to manage their risks and decrease the level of uncertainty they will face. Since this paper aims to explore the role of derivative markets, the third function provided by financial intermediaries becomes the one this paper is mainly concerned with. In Levine (2004), the risks that can be managed using the services provided by financial intermediaries are divided into three categories; cross sectional risk, intertemporal risk and liquidity risk. Several

works discussed the crucial role of financial markets in terms of the cross sectional diversification of risk. Acemoglu and Zilibotti (1997) is one of those works mentioned above; they theoretically analyze the relationship between diversification and growth and conclude that “that the process of development goes hand in hand with better diversification opportunities and more productive use of funds”. They argue that until an economy deepens its financial markets up to a certain level, the idiosyncratic shocks are not well diversified and this introduces an uncertainty to the growth process. The most important conclusion reached to is that variability of growth decreases and productivity endogenously increases as the diversification opportunities improve. King and Levine (1993) assert that financial systems that enable risk diversification promote innovative and thus growth-enhancing projects. The second aspect of risk diversification is the diversification of liquidity risk. In Levine (2004), it is stated that some high return projects require long periods of commitment, but savers, on the other hand, do not prefer to lose the control of their assets for such long periods. The services provided by financial intermediaries enable the savers to manage their liquidity risk and therefore foster the amount of sources devoted to high return, longer term projects. The final type of risk which is eliminated through financial intermediation is the intertemporal risk. Economic agents may try to eliminate the risks that cannot be diversified at a particular point in time. Levine (2004) states that “long run intermediaries can facilitate intergenerational risk sharing by investing with a long-run perspective and offering returns that are relatively low in boom times and high in slack times”. Although derivative markets are one of the financial markets that provide the economic agents the opportunity to share intertemporal risk, the literature on finance-macro relation

including Levine (2004) does not mention the possible crucial role of derivative markets.

Being analyzed the theoretical framework on which the finance-macroeconomics relation has been constructed, we can now proceed to the review of the empirical works. Several empirical works were conducted to analyze the relation between the depth of financial markets and economic growth beginning with Goldsmith (1969). Using the data of 35 countries from 1860 to 1963, Goldsmith (1969) analyzed the relation between the size of the financial system and growth. The size of the financial system is proxied by the size of the banking system in Goldsmith (1969). Although he found a significant correlation between these two variables, he did not attempt to draw any conclusion regarding the causal relation. This seminal work of Goldsmith inspired many other researchers. King and Levine (1993b) examine the relationship between level of financial development and growth and sources of growth. Using a cross section of 80 countries, they conclude that there is a long run relation between the level of financial development and economic growth. Four variables were used as a measure of financial development; the ratio of liquid liabilities to GDP, the ratio of bank credit to bank credit plus central bank's domestic assets; the ratio of credit issued to the private firms to total domestic credit and the ratio of credit issued to the private firms to GDP.

Beck, Levine and Loayza (2000) empirically assess the impact of financial intermediaries on private savings rates, capital accumulation, productivity growth and overall economic growth. They used the same four variables with King and Levine (1993b) as a measure of financial development. Using instrumental variable estimation technique and dynamic panel data techniques, Beck, Levine and Loayza

(2000) conclude that there is a large and significant relation between financial development and real per capita GDP growth and total factor productivity growth. However, the relation between financial development and physical capital growth and private savings rate is ambiguous.

Levine and Zervos (1996), on the other hand, investigate the role of stock market development on long run growth. They use an aggregate index of overall stock market development which combines information on size, liquidity and integration with world capital markets. The results suggest a strong positive relation between stock market development and long run growth.

There are also works that simultaneously investigate the role of banks and stock markets. Levine and Zervos (1998) claim that banks provide different services from those of stock markets; thus measures of stock market development and banking development should enter the growth regressions simultaneously and significantly. They find that stock market liquidity is positively and significantly correlated with current and future rates of economic growth, capital accumulation and productivity growth. Moreover, the level of banking development also enters these regressions significantly.

After briefly summarizing the literature on the finance-macro relation, I will now review some papers that aim to investigate the relationship between investment and uncertainty. Hartman(1972) is one of the first papers analyzing this relation. Hartman (1972) reaches to the conclusion that increasing output price uncertainty leads to an increasing level of investment. The output here is the physical output of

the firm. Pindyck (1982), on the other hand, draws the same conclusion, but dependent on a condition. He asserts that increased price uncertainty leads to increased level of investment only if the marginal adjustment cost function is convex. If this function is concave, then increased uncertainty leads to less investment. The positive effect of uncertainty on investment is because of the fact that price uncertainty raises expected marginal profits and increase capital accumulation. These papers, however, do not take into consideration the effect shareholders' risk aversion. Risk averse shareholders demand less capital, when uncertainty increases; thus the level of investment reduces. Zeira (1990) takes into consideration both of these opposing effects. The main conclusion of this paper is that increased price uncertainty can have negative effects on investment when the shareholders are risk averse. Caballero (1991) aims to "highlight the role of the decreasing marginal return to capital assumption in determining the effects of adjustment cost asymmetries on the sign of the response of investment to changes in uncertainty". The main conclusion reached to is that the investment-uncertainty relation is not robust. The reader should note that the uncertainty referred in all these papers is the uncertainty related with the operations of the firm.

As can be seen from the very brief review of the related literature, none of the existing works stress the role of derivative markets in maintaining economic well-being. The existing works explore the finance-macroeconomics relation from a somewhat restricted point of view; they only take into consideration the banks and stock markets while trying to explain the effect of financial intermediation on economic well-being. However, derivative markets can also give clues about the financial depth of a country. On the other hand, serving as a tool of risk management,

derivatives provide a medium for efficient sharing of risks and enable the economic agents to reduce the unsystematic risk and thus the level of uncertainty they will face. This reduction in uncertainty has implications on the level of investment. This paper will fill the gap in the literature by analyzing the impact of derivative markets on macroeconomic conditions with a methodology different from the existing one.

CHAPTER 3

DATA, METHODOLOGY AND RESULTS

In this chapter I will first describe the data set used in the empirical analysis. Subsection 3.2 will present the methodology of the paper in detail. In the last subsection, the results of the regression analysis will be presented.

3.1 Data Description

There are mainly three types of data sets used in this paper; the first one is the related macroeconomic variables for the period 1960-1999, the second one is the list of derivative markets operating in the year 1999 and the last one is the volume figures of derivative markets between the years 1990 and 1999. In this part of the paper, I will describe these data sets in detail.

A significant portion of the macroeconomic data was retrieved from Penn World Tables. This data set includes the real gross domestic product per capita (cgdp), investment share of the gross domestic product (ci) and the population growth rate (popgrowth). These data exist for 152 countries for the years 1960-1999,

3.2 Methodology

$$Y_t = K_t^\alpha A_t L_t^{1-\alpha}$$

$$\begin{aligned} L_t &= L e^{nt} \\ A_t &= A e^{gt} \end{aligned}$$

$$(k=K/AL)$$

$$(y=Y/AL)$$

$$\begin{aligned}\dot{k} \; t &= s y \; t - n + g + \delta \; k \; t \\ \dot{k} \; t &= s k \; t^{\alpha} - n + g + \delta \; k \; t\end{aligned}$$

$$\delta \hspace{10em} dk/dt$$

$$k \; = \; s \; n + g + \delta \; \; \; ^{-\alpha}$$

$$\begin{aligned}y &= \Big(s \; n + g + \delta \; \; \; ^{-\alpha} \Big)^{\alpha} \\ \frac{Y}{L} &= A s \; n + g + \delta \; \; \; ^{\alpha} \; ^{-\alpha}\end{aligned}$$

$$\varepsilon$$

$$\left[\frac{Y \; t}{L \; t}\right] = a + \frac{\alpha}{-\alpha} \; \; s \; - \frac{\alpha}{-\alpha} \; \; n + g + \delta \; + \varepsilon$$

$$Y\,t=K\,t^{\,\alpha}H\,t^{\,\beta}\,A\,t\,L\,t^{\,-\alpha-\beta}$$

$$\begin{aligned}\dot{k}\,t &= s_k y\,t - (n+g+\delta)\,k\,t \\ \dot{h}\,t &= s_h y\,t - (n+g+\delta)\,h\,t\end{aligned}$$

$$\begin{aligned}k &= \left(\frac{s_k^{-\beta}s_h^{\beta}}{n+g+\delta}\right)^{-\alpha-\beta} \\ h &= \left(\frac{s_k^{\alpha}s_h^{-\alpha}}{n+g+\delta}\right)^{-\alpha-\beta}\end{aligned}$$

$$y=\left(\frac{s_k^{-\beta}s_h^{\beta}}{n+g+\delta}\right)^{\alpha-\alpha-\beta}\left(\frac{s_k^{\alpha}s_h^{-\alpha}}{n+g+\delta}\right)^{\beta-\alpha-\beta}$$

$$\left[\frac{Y\,t}{L\,t}\right]=a+\frac{\alpha}{-\alpha-\beta}\,\,s_k\,+\frac{\beta}{-\alpha-\beta}\,\,s_h\,-\frac{\alpha+\beta}{-\alpha-\beta}\,\,n+g+\delta\,+\varepsilon$$

$$\begin{aligned}
&= \alpha + \alpha + \alpha \left(+ + \delta \right) + \varepsilon \left(\right) \\
&= \beta + \beta + \beta \left(+ + \delta \right) + \beta + \varepsilon \left(\right) \\
&= \gamma + \gamma + \gamma \left(+ + \delta \right) + \gamma + \gamma + \varepsilon \left(\right)
\end{aligned}$$

γ

$$= \alpha + \alpha + \alpha + \alpha \left(+ + \delta \right) + \varepsilon \left(\right)$$

$$= \beta + \beta + \beta + \beta + (\gamma + \delta) + \beta + \varepsilon \quad (1)$$

$$= \gamma + \gamma + \gamma + \gamma + (\delta + \delta) + \gamma + \gamma + \epsilon$$

 γ

$$= \alpha + \alpha + \alpha \left(+ + \delta \right) + \varepsilon \left(\right)$$

$$= \gamma + \gamma + \gamma \left(+ + \delta \right) + \gamma + \varepsilon \left(\right)$$

$$= \delta + \delta + \delta \left(+ + \delta \right) + \delta + \delta + \varepsilon \left(\right)$$

3.3 Empirical Results

3.3.1 Analyzing the Effect of Existence of Derivative Markets

δ

α α

β β

β

λ

λ

3.3.2 Analyzing the Effect of Growth Rate of the Volume of Derivative Markets

CHAPTER 4

CONCLUSION

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Journal of Political Economy,

Journal of Financial Economics,

American Economic Review

Financial Structure and Development

Journal of Economic Theory,

*Center
for International Comparisons at the University of Pennsylvania
(CICUP)*

Journal of Monetary Economics.

Quarterly Journal of Economics,

*NBER Working Paper
Series*

*Policy Research Working Paper Series 1582, The World
Bank.*

American Economic Review

Quarterly Journal of Economics

American Economic Review,

Theorie der wirtschaftlichen entwicklung

Dynamics and Control

Journal of Economic

APPENDICES

APPENDIX A

Table 1: A Summary of the Variables Used

Country Name	Real Income per Capita	Investment Share of GDP	Population Growth Rate	Secondary School Enrollment Rate	Derivative Market Dummy
Algeria					
Argentina					
Australia					
Austria					
Bangladesh					
Barbados					
Belgium					
Bolivia					
Botswana					
Brazil					
Burundi					
Cameroon					
Canada					
Cape Verde					
Chad					
Chile					
China					
Colombia					
Comoros					
Congo, Republic of					
Costa Rica					
Benin					
Denmark					
Dominican Republic					
Ecuador					
El Salvador					
Equatorial Guinea					
Ethiopia					
Fiji					
Finland					
France					
Gabon					
Gambia, The					
Ghana					
Greece					
Guatemala					
Guinea					
Guyana					
Honduras					
Hong Kong					
Iceland					
India					
Indonesia					
Iran					
Ireland					
Israel					
Italy					

Table 1: A Summary of the Variables Used (cont.d)

Country Name	Real Income per Capita	Investment Share of GDP	Population Growth Rate	Secondary School Enrollment Rate	Derivative Market Dummy
Cote d'Ivoire					
Jamaica					
Japan					
Jordan					
Kenya					
Korea, Republic of					
Lesotho					
Luxembourg					
Madagascar					
Malawi					
Malaysia					
Mali					
Mauritania					
Mauritius					
Mexico					
Morocco					
Mozambique					
Namibia					
Nepal					
Netherlands					
New Zealand					
Nicaragua					
Niger					
Nigeria					
Norway					
Pakistan					
Panama					
Papua New Guinea					
Paraguay					
Peru					
Philippines					
Portugal					
Guinea-Bissau					
Romania					
Rwanda					
Senegal					
Seychelles					
Singapore					
South Africa					
Zimbabwe					
Spain					
Sweden					
Switzerland					
Syria					
Thailand					
Togo					
Trinidad & Tobago					

Table 1: A Summary of the Variables Used (cont.d)

Country Name	Real Income per Capita	Investment Share of GDP	Population Growth Rate	Secondary School Enrollment Rate	Derivative Market Dummy
Tunisia					
Turkey					
Uganda					
Egypt					
United Kingdom					
Tanzania					
United States					
Burkina Faso					
Uruguay					
Venezuela					
Zambia					

Country Name	1990-1994 average	1995-1999 average
--------------	-------------------	-------------------

Country Name	1990-1994 average	1995-1999 average
--------------	-------------------	-------------------

Table 3: Average Annual Growth Rate of Volume Figures

Country Name	1990-1994 average	1995-1999 average
---------------------	--------------------------	--------------------------

Table 4 : The Effect of Existence of Derivative Markets on the Steady State

Income per Capita (1960-1999)

Dependent Variable: Log of Income per capita in 1999			
	1	2	3
ln<i>c</i>			
ln(<i>n</i>+<i>g</i>+δ)			
ln<i>h</i>			
dummy			
Observations			
R-squared			
p-values			
(coefficient test)			
p-values			
(heteroskedasticity test)			
	δ		δ

Table 5 : The Effect of Existence of Derivative Markets on the Steady State

Income per Capita (1970-1999)			
Dependent Variable: Log of Income per capita in 1999			
	1	2	3
lnavgci70			
lnavgpopgrowth70			
lnavghk70			
dummy			
Observations			
R-squared			

Table 6 : The Effect of Existence of Derivative Markets on the Steady State

Income per Capita (1980-1999)			
Dependent Variable: Log of Income per capita in 1999			
	1	2	3
lnavgci80			
lnavgpopgrowth80			
lnavghk80			
dummy			
Observations			
R-squared			

Table 7 : The Effect of Existence of Derivative Markets on the Steady State

Income per Capita (1990-1999)

Dependent Variable: Log of Income per capita in 1999			
	1	2	3
lnavgci90			
lnavgpopgrowth90			
lnavghk90			
dummy			
Observations			
R-squared			

**Table 8: The Effect of Existence of Derivative Markets on the Growth Rate of
Income per Capita (1960-1999)**

Dependent Variable: Log Difference of Income per capita in 1999 and 1960			
	4	5	6
lninitcgdp			
lnci			
ln(n+g+δ)			
lnhk			
dummy			
Observations			
R-squared			
p-values			
(coefficient test)			
p-values			
(heteroskedasticity test)			
Implied λ			
		δ	
	δ		
λ			

**Table 9 : The Effect of Volume of Derivative Markets on the Growth Rate of
Income per Capita (1990-1999)**

Dependent Variable : Log of Income per capita in 1995 and 1999			
	7	8	9
ln<i>c</i>			
ln(<i>n</i>+<i>g</i>+δ)			
ln<i>h</i><i>k</i>			
ln<i>vol</i>growth			
Observations			
Number of countries			
p-values (coefficient test)			
			δ
			δ

Table 10: Testing the Validity of the Classical and the Augmented Solow Models (1990-1999)

Dependent Variable : Log of Income per capita in 1995 and 1999	7	8
Inci		
ln(n+g+δ)		
lnhk		
Observations		
Number of countries		

APPENDIX B

$$Y_t = K_t^\alpha H_t^\beta (A_t L_t)^{-\alpha-\beta} e^{dummy}$$

$$y_t = \frac{Y_t}{A_t L_t} \quad k_t = \frac{K_t}{A_t L_t} \quad h_t = \frac{H_t}{A_t L_t}$$

$$\begin{aligned} \dot{k}_t &= s_k y_t - n + g + \delta k_t \\ \dot{h}_t &= s_h y_t - n + g + \delta h_t \end{aligned}$$

$$y_t = k_t^\alpha h_t^\beta e^{dummy}$$

$$\begin{aligned} \dot{k}_t &= s_k k_t^\alpha h_t^\beta e^{dummy} - n + g + \delta k_t \\ \dot{h}_t &= s_h k_t^\alpha h_t^\beta e^{dummy} - n + g + \delta h_t \end{aligned}$$

$$dk_t/dt = dh_t/dt =$$

$$k_t = \left(\frac{s_k^{-\beta} s_h^\beta e^{dummy}}{n + g + \delta} \right)^{1/(-\alpha-\beta)}$$

$$h_t = \left(\frac{s_k^\alpha s_h^{-\alpha} e^{dummy}}{n + g + \delta} \right)^{1/(-\alpha-\beta)}$$

$$y_t = k_t^\alpha h_t^\beta e^{dummy}$$

$$\frac{Y}{AL} = \left(\frac{s_k^{-\beta} s_h^\beta e^{dummy}}{n + g + \delta} \right)^{\alpha/(-\alpha-\beta)} \left(\frac{s_k^\alpha s_h^{-\alpha} e^{dummy}}{n + g + \delta} \right)^{\beta/(-\alpha-\beta)} e^{dummy}$$

$$\frac{Y}{L} = \frac{s_k^{\alpha/(-\alpha-\beta)} s_h^{\beta/(-\alpha-\beta)} e^{dummy/(-\alpha-\beta)}}{n + g + \delta^{\alpha+\beta/(-\alpha-\beta)}}$$

$$\left(- \right) = A + \frac{\alpha}{-\alpha-\beta} s_k + \frac{\beta}{-\alpha-\beta} s_h + \frac{\alpha+\beta}{-\alpha-\beta} \ln(n + g + \delta) + \frac{1}{-\alpha-\beta} dummy$$