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Is there a Return-Risk Link in Education?

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ABSTRACT

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Risk averse investors have to be compensated in higher expected returns when facing investments with higher risk. Education is an important investment therefore we use the results for 16 countries to test the positive relationship between return to education and the risk involved in this investment. It seems that most of the countries fit the pattern well: higher risk – higher return.

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Keywords: Returns to Education, risk, quantile regression

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1. Introduction

The positive correlation between expected return and risk is a well-studied subject in finance. In his doctoral dissertation, Harry Markowitz developed the basic portfolio theory, which became known as the Capital Asset Price Model (CAPM) - see Markowitz (1952). In this model a linear relationship can be derived between risk and return[1].

From this model we retain the idea that there is a positive relationship between return and risk and test it to education or the investment in Human Capital. So the question we answer in this paper is: is there a positive relationship between return to education and the risk of the investment?

We use micro data for 16 countries for the year of 1995, or the available.[2] The paper is organized as follows. In the next section we present the variables used to measure returns to education and risk and their problems. In section 3 the results are shown. Our conclusions appear in the last section.

2. Returns and risk

To measure the returns to education, the Mincer (1974) equation was estimated for each country and the coefficient of education (corrected by the fact that it is a log-linear relationship) was then utilised. There are several problems with the use of this equation, including:

1) There are strong assumptions involved in deriving the equation (see, for instance, Asplund and Pereira (1999))
2) The exogeneity of education in the Mincer equation (see, for instance, Card (1999)).

[1] For a discussion of the CAPM model see, for instance, Berndt (1991), Campbell et al. (1997).

As we used data for 16 countries, the Mincer equation[3] seems a workable compromise and has been widely used.

To measure the risk of the investment we used the results of quantile regressions (Koenker and Bassett (1978)) on Mincer equation. Instead of adjusting the equation through the average, we used quantile regression to estimate the equation through certain points of the distribution (quantiles). This has the advantage of giving the influence of the covariates at different points of the curve (Pereira and Martins (2000)).

We use the difference between the coefficient of education at the last decile and the first decile[4] as the measure of the risk (this difference is positive except in one case, so we used the absolute values of this difference as an alternative), as we assumed that people do not know where they will end up in the distribution before entering the labour market (which generally occurs after they finish their studies).

The use of this difference has an advantage when compared with the variance of the OLS returns, as these returns are estimates themselves, and not verified values (as are the returns to assets used in CAPM estimates).

If there is a large difference in the estimated coefficients between the first and last decile, meaning that the return is much higher at the upper than at the lower decile, the individual faces a high risk, as the individual can end up at the lower decile. If the difference is small, there is almost no risk.

[2] For a description of the data-sets used see Pereira and Martins (2000).

[3] $\log y = \alpha + \beta\ \text{educ} + \delta_1\ \text{exp} + \delta_2\ \text{exp}^2$ where y is the wage, ed is education and exp is experience in the labor market.

3. Results

The following table shows the results from the estimations:

(insert table 1)

From the table we see that most of the results come from regressions using gross hourly wages as the dependent variable, and are for the year 1995.

To show the positive relationship between return (ols) and risk, we start calculating the correlation coefficient between the return and risk. Its value is high – .57.

From table 1, we construct dummy variables for years (yeari=1 if year=i, zero otherwise), type of wage (net=1, if net wages were used, zero otherwise). dif stands for the difference in returns between the last and first decile, absdif for its absolute value and ols for the OLS Mincer equation coefficient corrected.

We performed OLS estimation with White standard errors (as the dependent variables are estimates, themselves) and obtained the following results:

(insert table 2)

or

(insert table 3)

The coefficients all have the expected signs, even though one of them is not significantly different from zero at a 10% level. This is the case of return found when using net wages instead gross wages; where, as expected, a lower value appears (due to the progressivism of most income tax systems).

[4] The significance of the difference was tested for several countries and it showed to be significantly different from zero, provided the sample was large enough.

We cannot reject the hypothesis that the years ‘93, ‘94 and ‘95 have the same coefficient at any reasonable significant level, which is a side conclusion that seems interesting in itself, meaning that the risk free alternative return was constant over this time period.

The main funding is the positive relationship between return and risk. There seems to be a positive compensation to “be received” to face the risk of the investment in education.

To avoid the problem of linearity that is implicit in the results above, we performed the following exercise. We ordered the countries by decreasing values of return and by increasing values of risk. We then added the order values. If there was an inverse ordering, the sum would always be 17. We obtained the following result:

(insert table 4)

The average yielded the value of 17. Five out of the sixteen countries add 16 or 17, and most of the results are within one standard error of the average.

The outliers are the cases of Switzerland, Germany (both: high return and low risk) and the US and Sweden (both: low return and relatively high risk). For the rest the more risk individuals face, the higher their average return is, in a certain range.

4. Conclusions

The fact that there is a positive relationship between the return to education and the risk involved in the decision taken was expected, as finance theory predicts. Again education appears to be an investment having properties similar to investments in other assets.

This paper uses a particular measure of risk: the difference in returns in different deciles, to confirm the theory. Therefore, part of the difference of returns in different countries is due to different risks which the individuals face. This appears in a very surprising and intriguing way in the ranking analysis undertaken, as most countries' results are within a standard error of the value we would obtain if there were an inverse ordering between returns and risk.

At this stage using the argument that returns to education in a country are very high to press for increase in student fees can be rather misleading and if accepted can destroy existing equilibriums with unknown consequences.

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Tables to be inserted in the text:

Table 1 (the returns appear in %)

Country	Wages	year	OLS return	First decil return	Last decil return	Dif between last and first
Austria	Net	1993	9.7	7.2	12.8	5.6
Denmark	Gross	1995	6.6	6.3	7.1	0.8
Finland	Gross	1993	8.9	6.8	10.1	3.3
France	Gross	1993	7.6	5.9	9.3	3.4
Germany	Gross	1995	8	7.5	7.8	0.3
Greece	Net	1994	6.5	7.5	5.6	-1.9
Ireland	Gross	1994	8.9	7.8	10.4	2.6
Italy	Net	1995	6.4	6.7	7.1	0.4
Netherlands	Gross	1996	7	5.3	8.3	3
Norway	Gross	1995	6	5.5	7.5	2.1
Portugal	Gross	1995	12.6	6.7	15.6	8.9
Spain	Gross	1995	8.6	6.7	9.1	2.4
Sweden	Gross	1991	4.1	2.4	6.2	3.8
Switzerland	Gross	1995	9.5	8.7	10.6	1.9
UK	Gross	1995	8.6	4.9	9.7	4.8
USA	Gross	1995	6.3	3.9	7.9	4

Table 2

```
Regression with robust standard errors                Number of obs =      16
                                                      F(  5,     9) = 1957.53
                                                      Prob > F      =  0.0000
                                                      R-squared     =  0.9831
                                                      Root MSE      =  1.3989

------------------------------------------------------------------------------
             |               Robust
         ols |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         net |  -.0594735   .4831846    -0.123   0.905    -1.152513    1.033566
         dif |   .5565127    .169201     3.289   0.009     .1737533     .939272
      year91 |   1.985252    .642964     3.088   0.013     .5307662    3.439737
      year93 |   6.471456   .9839524     6.577   0.000     4.245601    8.697311
      year94 |   7.534957   .2900354    25.979   0.000     6.878851    8.191063
      year95 |   6.490306   .7973708     8.140   0.000     4.686527    8.294084
      year96 |   5.330462   .5076031    10.501   0.000     4.182184     6.47874
------------------------------------------------------------------------------
```

Table 3

Regression with robust standard errors

Number of obs	16
F(5, 9)	51.57
Prob > F	0.0000
R-squared	0.9818
Root MSE	1.4512

ols	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
net	-.5700131	.5674445	-1.005	0.341	-1.853662	.7136356
absdif	.56264	.1762516	3.192	0.011	.1639312	.9613489
year91	1.961968	.6697562	2.929	0.017	.446874	3.477062
year93	6.616513	.9744813	6.790	0.000	4.412083	8.820943
year94	6.719066	.86393	7.777	0.000	4.764721	8.673412
year95	6.529603	.7854792	8.313	0.000	4.752726	8.306481
year96	5.31208	.5287549	10.046	0.000	4.115953	6.508207

Table 4

	OLS	Rank 1	Diff	Rank 2	Sum
Portugal	12.6%	1	8.9%	16	17
Austria	9.7%	2	5.6%	15	17
Switzerland	9.5%	3	1.9%	5	8
Ireland	8.9%	4	2.6%	8	12
Finland	8.9%	5	3.3%	11	16
Spain	8.6%	6	2.4%	7	13
UK	8.6%	7	4.8%	14	21
Germany	8.0%	8	0.3%	2	10
France	7.6%	9	3.4%	10	19
Netherlands	7.0%	10	3.0%	9	19
Greece	6.5%	11	-1.9%	1	12
Denmark	6.6%	12	0.8%	4	16
Italy	6.4%	13	0.4%	3	16
US	6.3%	14	4.0%	13	27
Norway	6.0%	15	2.1%	6	21
Sweden	4.1%	16	3.8%	12	28
Average					17
Standard Deviation					5.5

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