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The Cointegration between Moonlighting and Unemployment in Estonia

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[Abstract]

The relationship between moonlighting and unemployment is based on the logic that downward pressure in wage rate due to massive unemployment either may discourage moonlighting through income effect or may induce moonlighting through substitution effect. This study disapproves any such relationship between moonlighting and unemployment in Estonia. Application of Engle Granger cointegration test to a quarterly time series data of Estonia from 2000:Q1 to 2021:Q4 confirms that there exists no such long run relationship between moonlighting and unemployment.

Key Words: *Moonlighting, Engle Granger Cointegration Analysis*

I

INTRODUCTION

Employment in multiple jobs by an individual at the same point of time is called moonlighting. Following the tradition in literature, Pauliakas (2017) defined moonlighting as "Multiple job-holding (MJH), or moonlighting, is when an individual holds more than one job or runs more than one business during a reference week, where his/her primary job typically refers to the one with the greatest number of hours usually worked". Moonlighting become more prevalent across modern globalized economies with flexible working conditions (Baines and Newell (2004), Combos, McKay and Wright (2007)). There is a numerous literature on the determinants of moonlighting but very few on how it varies with unemployment.

The relationship between moonlighting and unemployment depends on the relative strength of income and substitution effects. During recession income effect due to reduction in wage or working hours may decrease the desire for moonlighting since massive unemployment may increase the opportunity cost of holding

moonlighting jobs. In times of expansion income effect may lead to enhance the desire for moonlighting. Substitution effect works in opposite direction of the income effect. Therefore, the relationship between moonlighting and unemployment either may be positive or may be negative.

Stinson (1987) found some evidence of large growth of moonlighting during economic expansion between 1960 and 1970 in the U.S. while no such association was found during recessions. Bell, Hart and Wright (1997) have claimed that hedging behavior against future unemployment may encourage an employee to moonlight. Conway and Kimmel (1998) argued that job-heterogeneity, in addition to constraint motives, is an important motive for moonlighting. As per their theoretical analysis, an increase in non-wage income may lead to a decline in moonlighting. This logic indicates the countercyclicality of moonlighting. Employment Policy Institute (1999) has addressed a positive relationship between moonlighting and unemployment. Partridge (2002) specified pro-cyclicality between moonlighting and unemployment on the logic that moonlighting may rise during periods of rapid economic growth and labor shortages. After apprehending the fact that chance of moonlighting may increase during the periods of economic expansion, Amuedo-Dorantes and Kimmel (2005) have concluded that moonlighting and unemployment are negatively related.

This paper is aimed to uncover the cointegration or long run relationship between moonlighting and unemployment in Estonia.

II
METHODOLOGY

To find out the cointegration relationship between moonlighting and unemployment in Estonia, the following model is considered:

$$MOON_t = \beta_0 + \beta_1 UNEMP_t + u_t \qquad (1)$$

Where

$MOON_t$ stands for Percentage of Multiple Jobholders to the total employed persons at time t.

$UNEMP_t$ stands for unemployment rate at time t.

We have to execute the Engle Granger procedure for understanding the cointegration between MOON and UNEMP.

Step 1: We have to check for stationarity of variables MOON and UNEMP using Augmented Dickey Fuller (ADF) test. If the variables show non-stationarity, necessary differencing are required to make variables stationary. We also have to confirm that both variables are integrated with same order.

Step 2: After estimating the long-run model (1), we get

$$\widehat{MOON}_t = \hat{\beta}_0 + \hat{\beta}_1 UNEMP_t$$

We have to get the residuals $\epsilon_t = MOON_t - \widehat{MOON}_t$ and judge whether it is stationary or not. If ϵ_t is stationary, we can say that MOON and UNEMP are cointegrated. In this case the statistics of ADF critical significance values are useless, we have to use only the t value of ADF test statistic. If the t value of ADF test statistic lies outside the critical values for regression-residuals test tables, residuals are regarded as stationary and there exists cointegration relationship.

III
EMPIRICAL RESULTS

For empirical analysis all data are obtained from the official statistics portal of the European Union, http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/ . The quarterly data of Estonia from the first quarter of 2000 to the last quarter of 2021 on "number of employed persons ('000)", "number of employed persons having second job ('000)" and "unemployment rate" (UNEMP) are downloaded. Then data on percentage of employed persons having second job (MOON) is calculated. Table – 1 shows the summary statistics of the data.

Table – 1: Summary Statistics

	MOON	UNEMP
Mean	4.805804	8.820455
Median	4.865163	7.700000
Maximum	8.101266	19.50000
Minimum	2.800190	4.000000
Std. Dev.	1.080865	3.600292
Skewness	0.185850	0.752837
Kurtosis	2.857641	2.876727
Jarque-Bera	0.580900	8.368248
Probability	0.747927	0.015236
Sum	422.9107	776.2000
Sum Sq. Dev.	101.6395	1127.703
Observations	88	88

Source: Own computation based on secondary data from http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/.

From the table it is clear that, maximum and minimum moonlighting rate are 8.1 and 2.8 percent of the total employed persons in Estonia. Maximum and minimum unemployment rate are 19.5 and 4 in Estonia. This implies a large variability of the variables.

The unit root test results on the basis of ADF test for the null hypothesis that the series is not stationary is presented in Table – 2 where the ADF unit root test results are based on Akaike Information Criterion with maximum lag eleven.

Table 2. Unit Root Test

	ADF Test Statistic (Based on AIC, Max Lag=11)			
	Intercept		Trend and Intercept	
	Level	First Difference	Level	First Difference
MOON	-0.750579	-9.333694*	-2.897317	-9.553368*
UNEMP	-2.652399	-8.118948*	-3.313833	-8.057773*

Note: * denote rejection of the null hypothesis at 1% level of significance.

Source: Own computation based on secondary data from http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/.

From table 2 it is clear that all the variables are integrated at first difference. Therefore, since all the variables are I(1), following Engle Granger method, we may apply OLS to find out the cointegration or the long run relationship among the variables. The regression equation is given in (2),

$$\widehat{MOON}_t = 4.710534 + 0.010801 UNEMP_t \qquad (2)$$
$$\text{t-Statistic} = (15.29559)\ \ (0.333856)$$

As per regression result, the UNEMP has no influence on MOON since the coefficient of UNEMP is insignificant. To avoid spurious regression, the residual series is generated from (2). The ADF test is performed on the residuals obtained from (2) without trend and intercept to examine unit root. We get ADF test statistic t= -0.734652. Comparing with the Augmented Engle–Granger asymptotic critical values we conclude that residuals are non-stationery and any possibility of long run relationship between moonlighting and unemployment in Estonia is rejected.

IV
CONCLUSION

The theoretical relationship between moonlighting and unemployment is based on the relative strength of income and substitution effects owing to wage variation. This study disapproves any such relationship between moonlighting and unemployment in Estonia. Application of Engle Granger cointegration test to a quarterly time series data of Estonia from 2000:Q1 to 2021:Q4 confirms that moonlighting and unemployment in Estonia are not related in the long run.

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