The Cointegration between Moonlighting, Hours Constraint and Unemployment in Latvia

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[Abstract]

The primary aim of this study is to investigate the cointegration between moonlighting, hours constraint and unemployment in Latvia. To examine the long run association, Johansen cointegration analysis is applied on the quarterly data obtained from Eurostat for the period of 2005 Q1 to 2015 Q4. ADF tests of the data confirm that all three variables are integrated of order one. Both the Maximum Eigenvalue and Trace tests reveal that there is only one cointegrating equation. The empirical analysis for the long run suggests that unemployment affects moonlighting in an inverse way while the effect of hours constraint on moonlighting is insignificant in Latvia. On the other hand, the short run error correction model suggests that the hours constraint is an important determinant of moonlighting while the role of unemployment is insignificant. Therefore, this paper concludes that unemployment is an important determinant of moonlighting in the long run whereas hours constraint is an important predictor of moonlighting in the short run in Latvia. The Granger Causality tests confirm that unemployment unidirectionally Granger causes moonlighting in Latvia.

Keywords: *Moonlighting, Hours Constraint, Unemployment, Johansen Cointegration Analysis*

I
INTRODUCTION

Moonlighting, or Second Jobholding, refers to the practice of holding multiple jobs simultaneously (Shisko and Rostker (1976), Krishnan (1990), Renna and Oaxaca (2006), Yamb and Bikoue (2016)). According to Paula (2007), the term 'moonlighting' was coined to describe multiple jobholding because, prior to the advent of modern industrial economies, most multiple jobholders worked second or part-time employment at night. As the complexity of the economies has increased due to industrialization, incidence of multiple jobholding or moonlighting has increased for a variety of reasons; however, nighttime execution of the secondary activities become irrelevant.

Moonlighting is becoming more widespread because of widening flexibility in working conditions (Baines and Newell (2004), Combos, McKay and Wright (2007)). Despite noticeable prevalence of moonlighting in modern economies, little focus has been paid to it (Combos, McKay and Wright (2007)). However, the study

on moonlighting experienced a new surge in recent years as the impacts of moonlighting became more obvious in contemporary economies.

The impact of moonlighting on modern society is ambiguous. The examples of welcoming features of moonlighting include the value addition by moonlighting artists (Casacuberta and Gandelman (2006)) or skill facilitation by moonlighting (Dickey, Watson and Zangelidis (2009), Panos, Pouliakas and Zangelidis (2011)). But moonlighting cannot be greeted for its role of strengthening shadow economy. Moonlighters frequently attempt to avoid paying taxes on their earnings from secondary employment (Frey and Schneider (2000), Schneider (2010), Barth and Ognedal (2005)). Moonlighting could also lead to some distortions in performance and productivity in the markets where both public and private provisions are prominent (Biglaiser and Ma (2007)).

Economists have varying opinions about the nature of secondary occupations. Shisko and Rostker (1976) regarded steady, full-time employment as primary and other additional jobs as secondary jobs. Paxson and Sicherman (1996) considered moonlighting as portfolio selection of primary and secondary jobs where primary jobs offer low but consistent income and secondary jobs offer high income but are more variable in character. The job informality criterion was given a lot of importance in the study of Guariglia and Kim (1999). Secondary jobs are considered as tax evading illicit jobs in the studies of Sennholz (1984), Frey and Schneider (2000), Schneider and Enste (2002). Betts (2006) considered moonlighting as parallel employment in part time jobs in addition to a main full-time job. In this paper, we refer to any form of having multiple jobs as moonlighting and ignore the characteristics of secondary jobs.

There are variety of economic and non-economic factors that have influence on second job holding (moonlighting). The most important economic reason behind moonlighting is the 'Hours Constraint'. The 'Hours Constraint' is the worker's inability (constraint) to supply as much hours of work in the primary job as he wishes in his utility maximizing level in a given wage rate. The hours constrained worker will tend to invest 'unutilized' hours into other secondary jobs. The hours constrained worker will spend 'unused' time into secondary jobs if the wage offered in the moonlighting job lie between the reservation wage and the wage rate of the primary job (Shisko and Rostker (1976), O'Connell (1979), Krishnan (1990), Allen (1998), Conway and Kimmel (1998), Böheim and Taylor (2004), Adhikary and Pal (2012)). The desire for work in a variety of heterogeneous jobs is another recognized proximate reason behind moonlighting, in addition to the 'hours constraint' motive (Conway and Kimmell (1998), Kimmel and Conway (2001), Boheim and Taylor (2004)). Abdukadir (1992) identified liquidity constraint as another proximate reason behind moonlighting. Liquidity constraint is the failure to live a typical lifestyle like the rest of the society due to low current income compared to their level of education. In addition, negative financial shock is also identified as an important economic factor behind moonlighting by Boheim and Taylor (2004). Negative financial shock tends to alter the labor supply preferences, which influences the workers for choosing

secondary employment. Workers working in the primary jobs with high risk of termination may opt for auxiliary employment as insurance against fear of job loss.

This hedging behavior against job insecurity as a reason behind moonlighting was identified by Bell, Hart and Wright (1997). Friesen (2001) argued that regulations that limit or prohibit overtime pay in the primary job may lead a worker to moonlight. Moonlighting, according to Paxson and Sicherman (1996), is simply the portfolio selection of various jobs. Concentrating on the connection between moonlighting and job mobility, they claimed that the workers portfolio diversifies the available hours of work between two complementary jobs, the underpaid but steady primary job and well paid but less stable secondary jobs. Since a large proportion of cross-section studies identified the 'Hours Constraint' as the most crucial economic factor, this paper is aimed to find out the cointegration between hours constraint and second job holding in Latvia using quarterly time series data for the period of 2005 to 2015.

Coghill (1967) studied the relationship between moonlighting and unemployment and argued that the relationship entirely depends on the conditions of the labour market. The direction of the relationship between moonlighting and unemployment is ambiguous and contingent upon the relative strength of income and substitution effects. During recession the decreased wage rate may induce the workers to opt for auxiliary (moonlighting) employment in order to maintain average standard of living. But the decreased wage rate may act as stimulant of desire for leisure. Due to greater flexibility of auxiliary (moonlighting) jobs than the standard full-time prime jobs, recruiters may encourage moonlighting to cope with the economic downturn (Robinson (2009)).

Stinson (1987) studied Bureau of Labor Statistics data and arrived in the conclusion that United States has experienced a significant increase in moonlighting during economic expansion in the period of 1980 to 1985, but during recessions no such relationship has been found. Moonlighting is regarded as a strategy for protecting against potential unemployment in the study of Bell, Hart and Wright (1997). Conway and Kimmel (1998) asserted that a decrease in moonlighting may result from a rise in non-wage income. Amuedo-Dorantes and Kimmel (2005) have found that the likelihood of moonlighting may rise during expansionary times, particularly for female. The relationship between moonlighting and unemployment was also discussed in the study of Partridge (2002). The study of Zangelidis (2014) confirmed positive relationship between moonlighting and unemployment.

Latvia declared its independence from former Soviet Union on August 21, 1991. Latvia is a member of the NATO, WTO and the European Union. The economy of Latvia is part of the European Single Market. With a continuous experience of rapid economic growth, Latvia experienced a severe recession in 2009 due to variety of reasons including unsustainable current account deficit, collapse of the real estate market and large debt exposure. With the help of assistances from European Union and the International Monetary Fund, Latvia recovered from economic collapse and became one of the fastest growing economies in the European

Union. Eurostat data demonstrate that Latvia, like all other European countries, is impacted by second jobholding (moonlighting). The purpose of this paper is to explore the long run relationship between second jobholding, hours constraint and unemployment in Latvia using quarterly data from Eurostat for the period of 2005 Q1 to 2015 Q4. The Johansen Cointegration Test followed by Vector Error Correction Model (VECM) is used to identify the long run association.

II
METHODOLOGY

To examine the cointegration between 'Hours Constraint', 'Unemployment Rate' and 'Moonlighting' in Latvia, the following model is considered:

$$MOON_t = \beta_0 + \beta_1 HCONST_t + \beta_2 UNEMP_t + u_t \quad (1)$$

Where $MOON_t$ stands for the moonlighting rate at time t, $HCONST_t$ stands for 'Hours Constraint', measured in terms of change (or first difference) in 'Average number of actual weekly hours of work in main job' at time t and $UNEMP_t$ stands for unemployment rate at time t. All data are available at Eurostat, the official statistics portal of the European Union.

The following steps have been performed to explore the cointegration relationship. The first step of the analysis involves the selection of an appropriate lag. The next step is the determination of the order of integration of the variables. Use of the Augmented Dickey Fuller (ADF) test is quite common to test the stationarity of the variables. Transformation of nonstationary data requires differencing of the data. Johansen cointegration test requires the precondition that the variables are $I(1)$, i.e., variables are nonstationary in levels but stationary in first difference. Second step requires the Johansen test of cointegration using both Trace and Maximum Eigenvalue tests. The Johansen test of cointegration is a maximum likelihood method that determines the number of cointegrating vectors in a non-stationary time series. If the variables are cointegrated, the Error Correction Model (VECM) will be considered to find out the short run dynamics among variables. The relevant equation to be estimated is,

$$\Delta MOON_t = \beta_0 + \beta_1 \Delta HCONST_t + \beta_2 \Delta UNEMP_t + \beta_3 ECT_{t-1} + \epsilon_t \quad (2)$$

where ECT_{t-1} signifies the Error Correction Term at time (t-1) and Δ indicates first difference of respective variables. The last step requires the application of Pairwise Granger Causality Test to investigate the direction of the short run causality between variables.

III
EMPIRICAL RESULTS

All the required data for empirical analysis is downloaded from the Eurostat (European Union's official statistics portal https://ec.europa.eu/eurostat/web/lfs/data/database). The quarterly data of Latvia from the first quarter of 2005 to the last quarter of 2015 on "number of employed persons (NEP)", "number of employed persons having second job (SJH)", 'average number of actual weekly hours of work in main job' (ACWH) and the "unemployment rate" (UNEMP) are downloaded. Then moonlighting rate $MOON_t$ is calculated in terms of percentage of SJH_t to the 'Number of Employed Persons' (NEP_t) at time t, $\left(MOON_t = \frac{SJH_t}{NEP_t} \text{x} 100\right)$. The Hours Constraint ($HCONST_t$), is measured in terms of change (or first difference) in 'average number of actual weekly hours of work in main job' ($HCONST_t = \Delta ACWH$). Due to this differencing, we lost a datum and total observation reduces to 43.

The summary statistics of the data is presented in Table – 1. This summary statistics states that moonlighting in Latvia varies from 3.68 percent to 6.56 percent and unemployment rate varies from a very low 5.3 percent to a very high 21.3 percent. Hours constraint, measured in terms of change in the working hours in primary job, varies from a decline of two hours to an increase in 1.4 hours. This suggests that the variables are highly variable within the period 2005 Q1to 2015 Q4 in Latvia.

Table – 1: Summary Statistics

	MOON	HCONST	UNEMP
Mean	5.114499	-0.081395	11.98837
Median	5.022997	0.000000	10.70000
Maximum	6.562377	1.400000	21.30000
Minimum	3.684211	-2.000000	5.300000
Std. Dev.	0.778840	0.833311	4.539730
Skewness	0.169112	-0.517836	0.378390
Kurtosis	1.990223	2.513322	2.031918
Observations	43	43	43

Source: Own computation based on secondary data from Eurostat

The results of ADF test to identify the order of integration of variables is presented in Table 2. From this table it is clear that all variables are $I(1)$, i.e., all variables are nonstationary in levels but stationary in first difference. Therefore, we can safely proceed to the Johansen Cointegration analysis.

The appropriate lag length has to be determined before conducting the Johansen Cointegration Analysis. Table - 3 presents the VAR lag order selection criteria. All the criteria for VAR lag selection suggests lag three is the optimum lag length of our data.

Table – 2: Unit Root Test

	ADF Test Statistic (Based on SIC, Max Lag=9)			
	Intercept		Trend and Intercept	
	Level	First Difference	Level	First Difference
MOON	-2.602872	-7.427558*	-2.564786	-7.429086*
HCONST	-2.571939	-20.77147*	-2.942654	-20.41943*
UNEMP	-1.736504	-3.543855*	-1.617030	-3.548741*

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

Source: Own computation based on secondary data from Eurostat

Table – 3: Lag Selection Criteria

VAR Lag Order Selection Criteria						
Endogenous variables: MOON HCONST UNEMP						
Exogenous variables: C						
Sample: 2005Q1 2015Q4						
Included observations: 39						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-193.7091	NA	4.826136	10.08764	10.21561	10.13356
1	-130.5485	113.3650	0.300809	7.310181	7.822046	7.493834
2	-112.4664	29.67323	0.190633	6.844431	7.740195	7.165823
3	-89.77425	33.74731*	0.096690*	6.142269*	7.421932*	6.601401*
4	-81.90058	10.49823	0.107082	6.200030	7.863591	6.796901
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Source: Own computation based on secondary data from Eurostat

Table 4 and 5 shows the Johansen Unrestricted Cointegration Rank Test for Trace and Maximum Eigenvalue respectively. Both the tests confirm that there is one cointegrating equation at 5% level of significance. Since there is one cointegrating equation as depicted in tables 4 and 5, estimation of equation (1) can provide information about the long run association between variables. With the existence of a long run relationship between variables, we estimate equation (1) through OLS. Table - 6 summarizes the estimated long run beta coefficients, t-statistics and p values for the cointegrating relationship.

Table – 4: Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.456308	38.93413	35.19275	0.0188
At most 1	0.220364	15.16857	20.26184	0.2169
At most 2	0.130650	5.460368	9.164546	0.2367
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Own computation based on secondary data from Eurostat

From the Table - 6 it is clear that hours constraint has no role in explaining moonlighting in Latvia, since the coefficient of HCONST is insignificant. However, the coefficient of UNEMP is significant which means that in the long run moonlighting is affected with the presence of unemployment inversely in Latvia. This result supports the results of Stinson (1987) that incidence of moonlighting may expand in times of economic expansion. The result contradicts the findings of Zangelidis (2014) where positive relationship between moonlighting and unemployment was asserted.

Table – 5: Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.456308	23.76556	22.29962	0.0310
At most 1	0.220364	9.708206	15.89210	0.3617
At most 2	0.130650	5.460368	9.164546	0.2367
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Source: Own computation based on secondary data from Eurostat

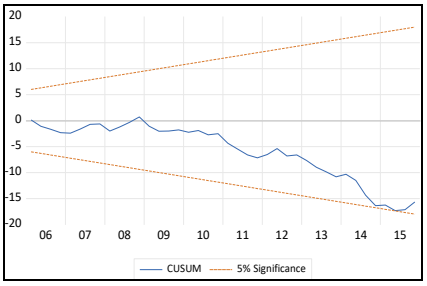
Table – 6: Estimation of the Long Run Relationship

Dependent Variable: MOON				
Sample (adjusted): 2005Q2 2015Q4				
Included observations: 43 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	6.532543	0.243959	26.77724	0.0000
HCONST	-0.127176	0.103630	-1.227212	0.2269
UNEMP	-0.119148	0.019022	-6.263646	0.0000
R-squared	0.509214	Mean dependent var		5.114499
Adjusted R-squared	0.484675	S.D. dependent var		0.778840
S.E. of regression	0.559099	Akaike info criterion		1.742236
Sum squared resid	12.50369	Schwarz criterion		1.865110
Log likelihood	-34.45806	Hannan-Quinn criter.		1.787548
F-statistic	20.75094	Durbin-Watson stat		1.200135
Prob(F-statistic)	0.000001			

Source: Own computation based on secondary data from Eurostat

Table 7 shows the diagnostic test results. There is no heteroskedasticity since the Breusch-Pagan-Godfrey test does not rule out the null hypothesis of homoscedasticity at 5% level of significance. Similarly, the Breusch-Godfrey Serial Correlation LM Test does not reject the null hypothesis of no serial correlation at 5% level of significance. The RAMSEY reset test tells that the model is correctly specified. The CUSUM test also establishes the stability of the model.

Table 7: Diagnostic Tests for the Long Run Relationship

Diagnostic Tests	Results
Heteroskedasticity Test: Breusch-Pagan-Godfrey	F-statistic: 1.063212 Prob. F (2,40): 0.3549
Breusch-Godfrey Serial Correlation LM Test	F-statistic: 2.523068 Prob. F (3,37): 0.0726
Ramsey RESET Test	t-statistic: 0.928206 Prob.: 0.3590
CUSUM TEST	

Source: Own computation based on secondary data from Eurostat

The long-run relationship between moonlighting and unemployment is established through this Johansen cointegration analysis. However, this Johansen cointegration analysis cannot portray any link between hours constraint (defined as the change in "Average number of actual weekly hours of work in main job") and moonlighting in the long run in Latvia.

To assess the dynamics of the cointegrating relationship (1) when it moves away from its long run path to the short run path, we estimate the error correction model (2). The estimation result is presented in Table – 8. The results confirm that the coefficient of ECT_{t-1} has expected sign (negative) and significant, which implies that if there is disequilibrium in the short run, that will be adjusted in the long run. As is evident in Table - 8, hours constraint has impact upon moonlighting whereas unemployment rate is insignificant. Therefore, this study does not completely disqualify the role of hours constraint in determining moonlighting in Latvia; rather it can be stated that in the long run the hours constraint is not cointegrated with moonlighting whereas in the short run the hours constraint significantly affect moonlighting. Converse is the case for unemployment.

Table – 8: Estimation of the Error Correction Model

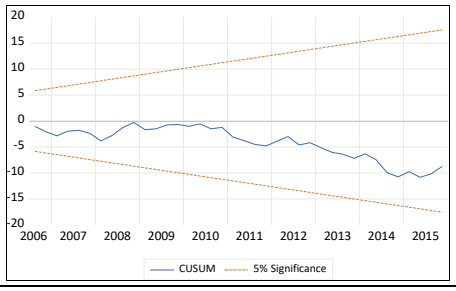
Dependent Variable: D(MOON)				
Method: Least Squares				
Sample (adjusted): 2005Q3 2015Q4				
Included observations: 42 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002008	0.079725	0.025191	0.9800
D(HCONST)	-0.124622	0.057734	-2.158572	0.0373
D(UNEMP)	-0.037451	0.061140	-0.612553	0.5438
ECT(-1)	-0.618716	0.150090	-4.122301	0.0002
R-squared	0.356637	Mean dependent var		0.019551
Adjusted R-squared	0.305845	S.D. dependent var		0.619322
S.E. of regression	0.515994	Akaike info criterion		1.604949
Sum squared resid	10.11749	Schwarz criterion		1.770441
Log likelihood	-29.70393	Hannan-Quinn criter.		1.665608
F-statistic	7.021533	Durbin-Watson stat		1.796621
Prob(F-statistic)	0.000717			

Source: Own computation based on secondary data from Eurostat

Table 9 portrays the diagnostic test results of error correction model. All the results confirm that there is no heteroskedasticity and no serial correlation at 5% level of significance. The RAMSEY reset test tells that the model is correctly specified. The stability of the short run model is established by CUSUM test.

The next step is to test for causality between variables using pairwise Granger causality tests. The test results are presented in Table – 10.

Table - 9: Diagnostic Tests for the Short Run Relationship

Diagnostic Tests	Results
Heteroskedasticity Test: Breusch-Pagan-Godfrey	F-statistic: 0.887382 Prob. F (2,40): 0.4564
Breusch-Godfrey Serial Correlation LM Test	F-statistic: 1.038193 Prob. F (3,37): 0.3877
Ramsey RESET Test	t-statistic: 1.325156 Prob.: 0.1932
CUSUM TEST	

Source: Own computation based on secondary data from Eurostat

Table - 10: Pairwise Granger Causality Test

Null Hypothesis	F-Statistic	Probability
HCONST does not Granger Cause MOON	1.48601	0.2398
MOON does not Granger Cause HCONST	1.07340	0.3525
UNEMP does not Granger Cause MOON	5.53635	0.0079
MOON does not Granger Cause UNEMP	0.83911	0.4402
HCONST does not Granger Cause UNEMP	4.92807	0.0128
UNEMP does not Granger Cause HCONST	1.52843	0.2306

Source: Own computation based on secondary data from Eurostat

The Table-10 clears that "UNEMP does not Granger Cause MOON" is rejected with 5% level of significance and we conclude that there is unidirectional causality run from UNEMP to MOON. This indicates that the changes in unemployment rate are able to predict the changes in moonlighting, while changes in moonlighting are not able to capture the changes in unemployment. Therefore, unemployment rate is an important determinant of moonlighting in Latvia.

IV
CONCLUSION

Shisko and Rostker (1976) have built a solid microeconomic foundation for the theoretical relationship between moonlighting and hours constraint. Numerous cross section studies have confirmed the role of hours constraint in influencing moonlighting decision by employees. The relationship between unemployment and moonlighting has also been examined in various studies. The primary goal of this study is to examine the impact of hours constraint and unemployment on the incidence of moonlighting in Latvia. The Johansen cointegration analysis is carried out using quarterly data for the period of 2005 Q1 to 2015 Q4.

Since all the variables are $I(1)$, we have conducted the Johansen Cointegration test. Both the Trace and Maximum Eigenvalue tests confirm that there is one cointegrating equation. The regression results suggest that in the long run, unemployment affects moonlighting in Latvia in an inverse way. That means when unemployment was decreasing (probably due to economic growth), moonlighting was increasing in Latvia. This conclusion is consistent with the findings of Stinson (1987) but contradicts the findings of Zangelidis (2014). If we consider unemployment as an index of job insecurity, the inverse relationship between moonlighting and unemployment disapproves the claim that moonlighting is caused due to the hedging behavior against future job insecurity (Bell, Hart and Wright (1997)).

The results also suggest that the role of hours constraint in determining moonlighting in the long run in Latvia is irrelevant, at least for the period of 2005 Q1 to 2015 Q4. The short run error correction model, on the other hand, tells a different story. In the short run, hours constraint is an important determinant of moonlighting while the role of unemployment is insignificant. Further, the Granger Causality tests confirm that unemployment unidirectionally Granger causes moonlighting in Latvia.

Therefore, application of Johansen cointegration analysis on the Eurostat data reveals that unemployment is an important determinant of moonlighting in the long run whereas hours constraint is an important predictor of moonlighting in the short run in Latvia.

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