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THE EXISTENCE OF RELATIONSHIP BETWEEN DEBT AND RECESSION

Key Words

Debt; Recession; Over indebtedness; Debt overhang; Depression; Business cycle.

Abstract

This paper examines the causal relationship between recession and debt by using Gross Domestic Product (GDP) and four debt indicators. Co-integration and Vector Error Correction Model (VECM)methods were implemented. The co-integration test suggests along run relationship between GDP and all debt indicators. The error correction coefficients in the Vector Error Correction Model (VECM) indicate that there is abi-directional causality between every debt variable and GDP in the long run. The findingis consistent with the debt-recession hypothesis.

Introduction

In 2007, a financial crisis hit the economies of the advanced industrialized nations, and by March 2009, the crisis had spread worldwide. At that point, it was the debt that needed to be looked after, and placing blame on debt as the cause of recession has had a long history. Since the 1920s, the relationship between debt and aggregate macroeconomic performance has been a cause of concern among economists. The role of high debt and high leverage is embedded in the history of economics - first with Irving Fisher, who wrote his debt-deflation theory about depressions based on the depression of 1837-41, 1873-79, and 1929. Irving Fisher believed that the cause of all great depressions is over-indebtedness and then deflation. He saw the depression as the result of over-borrowing during the expansion period that preceded the declining stage, with changes in the purchasing power of money, followed by a collapse in credit and drop in the price level.

> Each dollar of debt still unpaid becomes a bigger dollar, and if the over-indebtedness with which

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> we started was great enough, the liquidation of debts cannot keep up with the fall of prices which it causes. In that case, the liquidation defeats itself. While it diminishes the number of dollars owed, it may not do so as fast, as it increases the value of each dollar owed. Then, the very effort of individuals to lessen their burden of debts increases it, because of the mass effect of the stampede to liquidate in swelling each dollar owed. (Fisher, 1933, 344 and 349).

He summarizes his theory of debt and deflation as:

In summary, we find that: (1) economic changes include steady trends and unsteady occasional disturbances which act as starters for cyclical oscillations of innumerable kinds; (2) among the many occasional disturbances, are new opportunities to invest, especially because of new inventions; (3) these, with other causes, sometimes conspire to lead to a great volume of over-indebtedness; (4) this in turn, leads to attempts to liquidate; (5) these, in turn, lead (unless counteracted by reflation) to falling prices or a swelling dollar; (6) the dollar may swell faster than the number of dollars owed shrinks; (7) in that case, liquidation does not really liquidate but actually aggravates the debts, and the depression grows worse instead of better, as indicated by all nine factors; (8) the ways out are either laissez faire (bankruptcy) or scientific medication (reflation), and reflation might just as well have been applied in the first place (ibid)

Kindleberger's (2005) view of a recession is one in which a crisis evolves from a series of changes in events or circumstances, and goes through three stages: mania, panic and crash. Manias occur during a business cycle expansion in which economic agents move from liquid to real or financial assets. During the expansion phase, risk perceptions cause investors to think that returns will be higher than what they actually are. The power of over-optimism along with cheap credit sets the foundation for mania.

> Manias generally have been associated with the expansion phase of the business cycle, in part because the euphoria associated with the mania leads to increase in spending. During the mania, the increase in the prices of real state or stocks or in one or several commodities contribute to increases in consumption and investment spending that, in turn, leads to acceleration in the rates of economics growth. (. Kindleberger, 2005: 9)

The panic phase takes place when investors race to exchange real or financial assets with money. The shift to safe assets causes an excessive sharp decline in the price of the risky assets, which leads to the falling market. The change in perception could come from a change in the price momentum. The crash is the final outcome of the process, preceded by panic and mania. The crash phase comes when the market force pushes against the assets.

Minsky's (1987) Financial Instability Hypothesis (FIH) theory links financial market fragility to the normal life cycle of a free market economy. According to FIH, in expansion times of the business cycle, the corporate cash flow rises beyond that needed to pay off debt, and euphoria develops so that debts exceed what borrowers can pay off from their earnings, which results in a financial crisis. Minsky identified three kinds of borrowers that contribute to crisis through the accumulation of insolvent debt: hedge borrowers, speculative borrowers, and Ponzi borrowers. Hedge borrowers are the ones with cash flows that exceed principal and interest payments for every period. Speculative borrowers' cash flows only cover interest, although it is expected that the principal will eventually be paid when cash flows rise at some future time. Ponzi borrowers' cash flows do not cover even the interest payments but expect that the assets' price appreciation will cover their position in the near future. If hedge financing dominates, the economy will be in a stable position; however, the greater the weight of speculative and Ponzi finance, the greater the possibility that the economy will be heading toward crisis. Thus, Minsky suggests that over periods of economic expansion, economies usually move from a financial structure dominated by hedge finance (non-crisis situation) to a structure that increasingly emphasizes speculative and Ponzi finance (crisis situation). Thus, FIH is a model of business cycles based on the internal force that leads to destabilizing the economy.

During the expansion period, prices appreciate to the point that the Ponzi financiers hold assets that can no longer be sold at a profit, and their Ponzi business cash flows do not cover the level of debt acquired.Furthermore, banks start dealing with customers who no longer pay their debts. Interest rates rise as a result. Higher interest rates and higher debt to equity ratio turn the hedge borrowers to speculative borrowers and speculative borrowers to Ponzi borrowers. Borrowers start selling assets, which leads to declining asset prices. Thus, the asset market becomes flooded with supplied assets, euphoria turns to a panic, and the boom turns to recession.

There are several empirical studies examining the relationship between recession and debt using different measures of debts and finding different results. Within this body of work, King (1994) studied the economic recession in ten major industrialized countries and found that household debt is a source of recession, which supports Fisher's debt deflation theory. Schmitt's (2006) study provides no evidence for the hypothesis that a rising consumer debt burden signals any slowdown in the growth of consumer spending and the economy. Claessens *et al.* (2008) provide a comprehensive empirical characterization of the linkages between key macroeconomic and financial variables around business and financial cycles for 21 OECD countries over the 1960-2007 period. Their findings show that interactions between macroeconomic and financial variables play major roles in determining the severity and duration of a recession. Bordo and Haubrich (2009) identify major periods of credit distress from 1875 to 2007, and examine theireffect on output. Using the turning points technique, they identify and compare the timing, duration, amplitude, and movement of cycles in money, credit, and output. Regression results show that financial distress events exacerbate business cycles and makes recessions even worse. Schularick and Taylor (2009) show that credit growth is a powerful predictor of financial crises, suggesting that such crises are "credit booms gone wrong." Mian and Sufi's (2009) find that household leverage is a powerful predictor of the 2007 to 2009 recession and the findings suggest that a focus on household finance may help determine the sources of macroeconomic fluctuations. Glick and Kevin (2009) reportthat U.S. household leverage (ratio of debt to personal disposable income) increased from 55% in 1960 to 65% by the mid-1980s. Then, for the next two decades, leverage reached an all-time high of 133% in 2007. That dramatic rise in debt was associated with a steady decline in individual saving rate. Higher level of debt and lower rate of saving enabled personal consumption expenditures to grow faster than disposable income, providing a significant boost to U.S. aggregate demand over the period. However, consumption cannot grow faster than income for ever. Thus, consumers in long run need to cut spending in order to save and repay the debt. Therefore, recessions take place for a prolonged period of time until the debt comes to a sustainable level.Feng Zhu (2011)show that the credit-output relationship varies across countries and over time. Tests of causality between credit and real activity are inconclusive concerning the existence of causality and the

direction of causality, or concerning whether or not causality exists. In such, a different relationship emerges in the Euro area and Japan. Reuven and Lansing(2010) show that household leverage in the United States and most industrial countries increased substantially in the decade prior to 2007. Furthermore, they find that the larger the size of the household leverage, the bigger the decline in household consumption once house prices started falling and thus the more severe the recession. Cecchetti *et al.* (2011) studythe difference between good debt and bad debt. They use a dataset from 18 OECD countries for period from 1980 to 2010. The study findsthat beyond a certain level, debt is a drag on growth. For government debt, the threshold is around 85% of GDP. The immediate implication is that countries with such high debt must act quickly and decisively to keep debt well below the estimated thresholds. Their examination of other types of debt yields similar conclusions. For example, when corporate debt goes beyond 90% of GDP, it becomes a drag on economic growth, and for household threshold debt, it is around 85% of GDP.Jordà *et al.* (2011) examine the role of leverage in the business cycle. They used nearly 200 recession episodes in 14 advanced countries for period from 1870 to 2008, they found that the more credit-intensive booms tend to be followed by deeper recessions and slower recoveries, and the severity of recession depends on the rate of credit growth relative to GDP in the expansion phase.

Mian *et al.* (2011). found "The large accumulation of household debt prior to the recession in combination with the decline in house prices has been the primary explanation for the onset, severity, and length of the subsequent consumption collapse....., and show that the decline in consumption was much stronger in high leverage counties with large house price declines."

Eggertsson and Krugman (2012) constructed a simple New Keynesian-Style Model of debt-driven slumps. The Model showed situations in which an accumulated debt forced agents into rapid deleveraging. The result is a sharp decline in the aggregate demand.

The objective of the paper is to test the validity of the debt's theories which attribute recession to debt.The study uses cointegration and causality tests. This procedure enables us to investigate the short-run and long-run relationships between debt and recession.

The remainder of the study is organized as follows. Section 2 describes the empirical methodology

and the description of data. Section 3 presents empirical results. Section 4 contains the conclusion.

Data and Empirical Methodology

Data

This study uses quarterly data obtained from the U.S. Department of Commerce: Bureau of Economic Analysis and Board of Governors of the Federal Reserve System. Specifically, data was obtained from the following series: Consumer Price Index for All Urban Consumers (π) Total Loans and Investments at All Commercial Banks (LOANINV), Total Liabilities of Households and Nonprofit Organizations (TOTHLI), Total Commercial and Industrial Loans Including Foreign Related Institutions (TOTCI), The sum of all debt variables used in the study (ALD) which is defined: (ALD = LOANINV + TOTHLI + TOTCI. The data covers the period from 1973/1 to 2012/1. All data was deflated by the Consumer Price Index for All Urban Consumers and put in log form. Table 1 presents a descriptive summary of data.

Augmented Dick-Fuller (ADF) Test

On the side of empirical methodology, cointegration requires variables that are non-stationary in level but stationary after first-differencing. To test whether variables are stationary or not, unit root tests are performed. The timeseries properties of variables are examined by Augmented Dick-Fuller (ADF) unit root test. It is used to determine the order of integration of time series. The test is based on estimates of the following regression equations. For level:

$$\Delta x_t = \alpha_1 + \alpha_2 T + \alpha_3 x_{t-1} \sum_{i=1}^{p} \alpha_{4i} \Delta x_{t-i} + \varepsilon_t \quad (1)$$

And for first difference:

$$\Delta\Delta x_t = \alpha_1 + \alpha_2 T + \alpha_3 x_{t-1} \sum_{i=1}^{p} \alpha_{4i} \Delta\Delta x_{t-i} + \varepsilon_t \quad (2)$$

Table 1
Descriptive Statistics on Growth Rates of the Variables

	TOTHLI	TOTCI	LOANINV	GDP	π	ALD
Mean	3.466428	0.056765	0.071043	0.077944	4.748923	4.120168
Median	3.433623	0.049331	0.061690	0.067611	4.864453	4.059700
Maximum	4.442764	0.107568	0.139205	0.156680	5.232738	5.013109
Minimum	2.519396	0.038563	0.049240	0.051500	3.827184	3.337232
Std. Dev.	0.623697	0.016358	0.021014	0.024657	0.359192	0.539224
Skewness	0.090558	1.385195	1.515120	1.432585	-0.887414	0.153204
Kurtosis	1.720559	4.131176	4.407491	4.178590	2.824523	1.739846
Jarque-Bera	10.85352	58.57814	72.56202	62.78873	20.80778	10.93218

Where variable x_t the variable is tested for unit root; Δ is the first difference operator; ∞_1 'is the constant term; T is time trend; p is the number of the lag length which was selected to maximize AIC and SBC. The null hypothesis is $H_0 := \infty_3 = 0$ and the alternative hypothesis $H_1 : \infty_3 < 0$. When the absolute value of the calculated test is greater than the critical value from Mackinnon (1991), the null hypothesis of the unit root (non-stationary) is rejected, indicating that the variable is stationary at level and integrated of degree zero [I˜ (0)].

Cointegration Test

The study uses Johonsen and Juselius(1990) cointegration test, since our time series variables are nonstationary in level and stationary after first-differencing. Johonsen (1988, 1995) and Johonsen and Juselius(1990) implement a maximum likelihood procedure. This methodology tests for the number of cointegration relationships and estimates theparameters of such cointegrating relationships. The cointegration is applied by using vector autoregressive (VAR) model. A general unrestricted VAR model can be represented as the following:

$$\begin{aligned} y_t &= A_0 + A_1 y_{t-1} + ... + A_p y_{t-p} \\ &\quad +\eta_t \qquad t = 1, 2, ..., T \end{aligned} \tag{3}$$

where

$$\Delta y_t = A_0 + \sum_{i=1}^{p-1} \Gamma_i \Delta y_{t-i} + \prod y_{t-1} + \eta_t \tag{4}$$

Where

$$\prod = \sum_{i=1}^{o} A_i - I \quad and \quad \Gamma_i = -\sum_{j=i+1}^{p} A_j$$

If coefficient matrix $\prod$ has reduced rank $r < k$, then there exist k x r matrices α and β each with rank r such that $\pi = \alpha\beta'$ and βy_t is stationary. Here r is the number of cointegrating relationships, the elements of ? are defined as the adjustment parameters and each column of β is a cointegrating vector. In this paper real GDP and real debt are treated as endogenous, and inflation rate is treated as exogenous. The Johansen-Juselius test uses two test statistics through VAR model to identify the number of cointegrating vectors, namely the trace test statistic and the maximum Eigen-value test statistic. The test statistic for the trace test is given by:

$$Trace = -T \sum_{i=r+1}^{n} 1n(1 - \hat{\lambda}_i) \tag{5}$$

The trace tests null hypothesis is r = 0, cointegrating vectors against the alternative hypothesis of n cointegrating vectors.

The maximum eigenvalue test is given by:

$$\lambda_{max} = -T\ In(1 - \hat{\lambda}_{r+1}) \quad (6)$$

This test, on the other hand, tests the null hypothesis of r cointegrating vectors against the alternative hypothesis of (r + 1) cointegrating vectors.

Vector Error Correction Model (VECM):

Once cointegrationis established between variables, then there is a need for construction of the error correction mechanism to model a dynamic relationship. The aim of the error correction model is to indicate the speed of adjustment from the short run equilibrium to the long-run equilibrium. A Vector Error Correction Model (VECM) is a restricted VAR to be used with non-stationary series which are cointegrated. When the equilibrium conditions are imposed, the VECM describes how the model is adjusting in each time period towards its long-run equilibrium. Because of the variables are supposed to be cointegrated, then in the short-run, any deviations from long-run equilibrium will feedback on to the changes in the dependent variables in order to make their movements towards the long-run equilibrium. For this study VECM to be estimated as follows:

$$\begin{aligned}\Delta log y_t &= \propto_1 + \sum_{i=1}^{p} \propto_{2i} \Delta log\ y_{t-i} \\ &+ \sum_{i=1}^{n} \propto_{3i} \Delta log\ D_{t-i} + \sum_{i=1}^{n} \propto_{4i} \Delta\pi \\ &+ \propto_{5i} e_{t-1} + \delta_{1t}\end{aligned} \quad (7)$$

$$\begin{aligned}\Delta log rd_t &= \propto_1 + \sum_{i=1}^{p} \propto_{2i} \Delta log\ y_{t-i} \\ &+ \sum_{i=1}^{n} \propto_{3i} \Delta log\ D_{t-i} + \sum_{i=1}^{n} \propto_{4i} \Delta\pi \\ &+ \propto_{5i} e_{t-1} + \delta_{2t}\end{aligned} \quad (8)$$

Where e_{t-1} is the error correction term lagged one period with coefficient $\propto_5$ measuring adjustment of the model from the short-run to the long-run and is the white noise. The estimation of these two equations determines the nature of relationship between debt (D)and GNP.

Empirical Results

Augmented Dicky-Fuller Tests

Table 2 shows test results that do not reject the null hypothesis of unit roots for all variables in level forms. For the first difference all variables are stationary(at different levels of significance), indicating that these variables are in fact integrated of order one, I˜ (1).

Cointegration Result

Table 3 shows the result of Johnson cointegration. For the relationship between GDP and Total Loans

Table 2
(Phillips-Perron) Unit Root Test

variable	Level with Constant,	Level with Constant with Linear Trend	First with difference Constant	First with difference Constant, Linear Trend
GDP	2.776328	-1.682533	-5.780517**	-6.443008**
LOANIN	2.820519	-0.897647	-7.573835**	-8.554276**
TOTHLI	1.203897	-1.615783	-4.636315**	-5.118573**
TOTCI	-0.376328	-2.981441	-4.179924**	-4.191381**
ALD	1.681020	-1.465817	-4.334617**	-5.124174**
π	-1.392476	-2.286582	-10.00243**	-9.984630**

Note: *, **, Statistically significant at the 10%, 5% and 1% significant level

Table 3
Panel A:Cointegration Test: Debt Variable: LOANIN

r	Trace statistic	5% Critical Value	Max-Eigen statistic	5% Critical Value
None	51.61583**	42.44	28.53966*	25.54
At most 1	23.07617	25.32	18.35818	18.96
At most 2	4.717995	12.25	4.717995	12.25

Panel B: Cointegration Test: Debt Variable :TOTCI

r	Trace statistic	5% Critical Value	Max-Eigen statistic	5% Critical Value
None	51.82707**	42.44	23.35227	25.54
At most 1	28.47480*	25.32	20.69510	18.96
At most 2	7.779699	12.25	7.779699	12.25

and Investments at All Commercial Banks (LOANINV) is reported in Panel A. The null hypothesis of no cointegration (r = 0) against the alternative of presence of one or more cointegration is rejected at 1% level of significance in trace test and at 5% level of significance in maximum eigenvalue test. Thus, the two tests indicate onecointegrationequation. For the relationship between Total Commercial and Industrial Loans Including Foreign Related Institutions (TOTCI), and GDP (Panel B), the trace testindicatestwocointegratingrelation at 5% levelof significanceandonecointegratingrelation at 1% levelof significance.

For the gross domestic product (GDP) and Total Liabilities of Households and Nonprofit Organizations (TOTHLI), (Panel C), both trace and max-eigenvalue tests indicates two-cointegrating equations at the 5% level of significance and onecointegrating equation at the 1% level of significance. For the gross domestic product (GDP) and the sum of all debt variables used in the study (ALD), (Panel D) both trace and max-Eigenvalue tests indicatetwocointegrating equations at the 5% level of significance and onecointegrating equation at the 1% level of significance. In summary, the cointegrationresults indicate that there is long run relationship between GDP and every measure of debt variables (TOTCI, LOANIN, TOTHLI and ALD). This finding is consistent with debt-recession theories.

Vector Error Correction Model Result

Given the evidence in favor of cointegration, we use VECM to examine the dynamic relationship among the variables. The estimation result of VECM, shown in equations 9 to 16 (tables 5 to 8), is negative and significant.

$$\Delta InGDP_t = 0.2 - 0.04e_{t-i^{**}} + 0.26\Delta InGDP_{t-5} - 0.036\Delta In\pi^{**}_{t-5} - 0.25\Delta InLOANINV_{t-5} \quad (9)$$

$$\Delta InLOANINV_t = 0.17 - 0.04e_{t-i^{**}} + 0.2\Delta InGDP^{*}_{t-5} - 0.04\Delta In\pi^{**}_{t-5} - 0.18\Delta InLOANINV_{t-5} \quad (10)$$

$$\Delta InGDP_t = 0.2 - 0.04e_{t-i^{**}} - 0.12\Delta InGDP_{t-7} - 0.039\Delta In\pi^{**}_{t-7} + 0.18\Delta InTOTCI_{t-7} \quad (11)$$

$$\Delta InTOTCI_t = 0.1 - 0.3e_{t-i^{**}} - 0.07\Delta InGDP_{t-7} - 0.03\Delta In\pi^{**}_{t-7} - 0.057\Delta InTOTCI_{t-7} \quad (12)$$

$$\Delta InGDP_t = 0.019 - 0.4e_{t-i^{**}} + 0.12\Delta InGDP_{t-6} - 0.039\Delta In\pi^{**}_{t-6} - 0.0043\Delta InTOTHLI_{t-6} \quad (13)$$

$$\Delta InTOTHLI_t = 2.6 - 5.7e_{t-i^{**}} + 2.67\Delta InGDP_{t-6} - 0.55\Delta In\pi^{**}_{t-6} + 0.18\Delta InTOTHLI_{t-6} \quad (14)$$

$$\Delta InGDP_t = 0.18 - 0.04e_{t-i^{**}} + 0.1\Delta InGDP_{t-5} - 0.038\Delta In\pi^{**}_{t-5} - 0.006\Delta InALD_{t-5} \quad (15)$$

$$\Delta InALD_t = 2.6 - 6e_{t-i^{**}} + 0.23\Delta InGDP_{t-5} - 0.5\Delta In\pi^{**}_{t-5} - 32\Delta InALD_{t-5} \quad (16)$$

It issignificant in three GDP equationsand in three debt equations (equations 11 to 16) at 1% level of significance, indicating that a deviation from the long run equilibrium value in one period is corrected in the next period by the size of that coefficient. However, none of the debt coefficients in GDP equations and

Table 4
Panel C:Cointegration Test: Debt Variable :TOTHLI:

r	Trace statistic	5% Critical Value	Max-Eigen statistic	5% Critical Value
None	63.8816**	42.44	33.7217**	25.54
At most 1	30.15992*	25.32	21.34722*	18.96
At most 2	8.812701	12.25	8.812701	12.25

Panel D :Cointegration Test: Debt Variable: ALD:

r	Trace statistic	5% Critical Value	Max-Eigen statistic	5% Critical Value
None	65.22900**	42.44	38.13712**	25.54
At most 1	27.09189*	25.32	20.54122*	18.96
At most 2	6.550665	12.25	6.550665	12.25

Table 5
VECM Estimation of GDP and LOANINV

$$\Delta InGDP_t = 0.2 - 0.04e_{t-i^{**}} + 0.26\Delta InGDP_{t-5} - 0.036\Delta In\pi^{**}_{t-5} - 0.25\Delta InLOANINV_{t-5} \quad (9)$$

$$\Delta InLOANINV_t = 0.17 - 0.04e_{t-i^{**}} + 0.2\Delta InGDP^{*}_{t-5} - 0.04\Delta In\pi^{**}_{t-5} - 0.18\Delta InLOANINV_{t-5} \quad (10)$$

Error Correction:	D(LOGGDP$_t$)	LOANINV
CointEq1	-0.041944	-0.040886
	(0.00386)	(0.00352)
	[-10.8647]	[-11.6008]
$\Delta InGDP_{t-5}$	0.258445	0.223898
	(0.34410)	(0.31414)
	[0.75108]	[0.71274]
$\Delta InLOANINV_{t-5}$	-0.250232	-0.183533
	(0.37431)	(0.34171)
	[-0.66852]	[-0.53710]
$\Delta In\pi_{t-5}$	-0.036362	-0.035591
	(0.00347)	(0.00317)
	[-10.4825]	[-11.2389]
C	0.173258	0.169667
	(0.01657)	(0.01513)
	[10.4543]	[11.2141]

Note: Standard errors in ( ) & t-statistics in [ ]

Table 6
VECM Estimation of GDP and TOTCI

$$\Delta InGDP_t = 0.2 - 0.04e_{t-i^{**}} - 0.12\Delta InGDP_{t-7} - 0.039\Delta In\pi^{**}_{t-7} + 0.18\Delta InTOTCI_{t-7} \quad (11)$$

$$\Delta InTOTCI_t = 0.1 - 0.3e_{t-i^{**}} - 0.07\Delta InGDP_{t-7} - 0.03\Delta In\pi^{**}_{t-7} - 0.057\Delta InTOTCI_{t-7} \quad (12)$$

Error Correction:	D(LOGGDP)	TOTCI
CointEq1	-0.400023	-0.300460
	(0.04013)	(0.02880)
	[-9.96907]	[-10.4323]
$\Delta InGDP_{t-7}$	-0.123315	0.072208
	(0.13516)	(0.09701)
	[-0.91239]	[0.74435]
$\Delta InTOTCI_{t-7}$	0.177793	-0.056933
	(0.19494)	(0.13992)
	[0.91203]	[-0.40689]
$\Delta In\pi_{t-7}$	-0.038646	-0.029173
	(0.00401)	(0.00288)
	[-9.64739]	[-10.1464]
C	0.184703	0.139490
	(0.01920)	(0.01378)
	[9.62170]	[10.1238]

Note: Standard errors in ( ) & t-statistics in [ ]

Table 7
VECM Estimation of GDP and TOTHLI

$$\Delta InGDP_t = 0.019 - 0.4e_{t-i^{**}} + 0.12\Delta InGDP_{t-6} - 0.039\Delta In\pi^{**}_{t-6} - 0.0043\Delta InTOTHLI_{t-6} \quad (13)$$

$$\Delta InTOTHLI_t = 2.6 - 5.7e_{t-i^{**}} + 2.67\Delta InGDP_{t-6} - 0.55\Delta In\pi^{**}_{t-6} + 0.18\Delta InTOTHLI_{t-6} \quad (14)$$

Error Correction:	D(LOGGDP)	TOTHLI
CointEq1	-0.424371	-5.662212
	(0.03933)	(0.89370)
	[-10.7887]	[-6.33571]
$\Delta InGDP_{t-6}$	0.122479	2.662056
	(0.07325)	(1.66436)
	[1.67197]	[1.59944]

Cont. Table 7
VECM Estimation of GDP and TOTHLI

$InTOTHLI_{t-6}$	-0.004313	0.185062
	(0.00406)	(0.09230)
	[-1.06179]	[2.00500]
$\Delta In\pi_{t-6}$	-0.039292	-0.551966
	(0.00374)	(0.08488)
	[-10.5172]	[-6.50267]
C	0.187599	2.652607
	(0.01787)	(0.40598)
	[10.4988]	[6.53385]

Note: Standard errors in ( ) & t-statistics in [ ]

Table 8
VECM Estimation of GDP and ALD

$$\Delta InGDP_t = 0.18 - 0.04e_{t-i^{**}} + 0.1\Delta InGDP_{t-5} - 0.038\Delta In\pi^{**}_{t-5} - 0.006\Delta InALD_{t-5} \quad (15)$$

$$\Delta InALD_t = 2.6 - 6e_{t-i^{**}} + 0.23\Delta InGDP_{t-5} - 0.5\Delta In\pi^{**}_{t-5} - 32\Delta InALD_{t-5} \quad (16)$$

Error Correction:	D(LOGGDP)	ALD
CointEq1	-0.408984	-5.749127
	(0.03707)	(0.68834)
	[-11.0323]	[-8.35219]
$\Delta InGDP_{t-5}$	0.106842	0.236546
	(0.07810)	(1.45015)
	[1.36801]	[0.16312]
$\Delta InALD_{t-5}$	-0.005665	0.325520
	(0.00503)	(0.09337)
	[-1.12668]	[3.48646]
$\Delta In\pi^{**}_{t-5}$	-0.038050	-0.555826
	(0.00355)	(0.06591)
	[-10.7186]	[-8.43257]
C	0.181430	2.663620
	(0.01695)	(0.31477)
	[10.7022]	[8.46204]

Note: Standard errors in ( ) & t-statistics in [ ]

GDP coefficients in debt equations are significant.

Conclusion

This paper examines the causal relationship between recession and debt by using Gross Domestic Product (GDP) and various debt indicators. Cointegration and VECM tests are implemented in order to determine if there is stable long-run relationship between debt and recession and if there is any causality between these variables. The study uses four different debt measurements: LOANIN, TOTCI, TOTHLI, ALD.For the relationship between GDP and Total Loans and Investments at All Commercial Banks (LOANINV), the null hypothesis of no cointegration (r = 0) against the alternative of presence of one or more cointegration is rejected at 1% level of significance in trace testand at 5% level of significance in maximum eigenvalue test. Thus, the estimated two tests indicate onecointegration equations. For the relationship between Total Commercial and Industrial Loans Including Foreign Related Institutions (TOTCI) and GDP, trace tests indicatestwocointegrating equations at 5% levels of significanceand onecointegrating equation at and 1% levels of significance.For the Gross Domestic Product (GDP) and Total Liabilities of Households and Nonprofit Organizations (TOTHLI), and for the Gross Domestic Product (GDP) and the sum of all debt variables used in the study (ALD) the finding of trace and maximum Eigenvalue tests is identical. Both testsindicate twocointegrating equations at 5% levels of significance and onecointegrating equation at 1% levels of significance.

This finding is consistent with debt-recession theories. For Long-run causality which determined by the VECM, the estimation result of VECM showed that the error correction coefficients are negative and significant in three GDP equationsand in three debt equations at 1% level of significance, indicating that a deviation from the long -run equilibrium value in one period is corrected in the next period by the size of that coefficient.In general, the result indicates that there is abi-directional causality between every debt variableand GDP in the long run.Consequently, the policy implications of the study is that economists and policy makers need to fundamentally re-thinkhow debts in financial systems are regulated.

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الملخص

إمكانية وجود علاقة بين الدين والركود الاقتصادي

فوزان عبدالعزيز الفوزان
كلية الملك فهد الأمنية
المملكة العربية السعودية

تبحث هذه الدراسة العلاقة السببية بين الكساد الاقتصادي والدين؛ وذلك باستخدام الناتج المحلي الإجمالي (GDP) وأربعة من مؤشرات الدين. استخدمت الدراسة أنموذج التكامل المشترك وأنموذج (VECM). وقد دلت الدراسة على وجود علاقة طويلة المدى بين (GDP) ومؤشرات الدين المستخدمة في الدراسة. ودلّ أنموذج (VECM) بشكل عام على وجود سببية ثنائية طويلة المدى بين إجمالي الناتج المحلي ومؤشرات الدين.

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