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Simultaneous Equations Modeling: Examining The Relationship Between Money Wages, Labor, And Gross National Income In Jordan (2006-2022).

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Abstract:
This study delves into the structural simulation equations influencing the interrelation between W (money wages) and GNU (Gross National Income) simultaneous equations. The variables encompassed in both models include W, GNU, P, R, L, M, and the unemployment ratio, with all variable data expressed in percentage ratios, except for GNU, which is in millions J.D. The dataset draws from various sources, primarily relying on the Central Bank of Jordan's annual reports and I.M.F. reports spanning 2006–2022. Employing weighted least squares, two-stage least squares, the instrumental method, and Anova, the study scrutinizes the simultaneous equation models to ensure their fit to the data.
In this analytical framework, the structural equations of GNU involve both current and ratio values of affected variables in the structural models of GNU, with predictors and instrumental explanations including W, P, unemployment ratio, R, M, and L. The R-squared value for this model is 97.6%, indicating strong explanatory power. However, despite the high R-squared value, it is noteworthy that not all explanatory variables exhibit complete utility. In the TSLS (two-stage least squares) model, where the dependent variable is W (money wages), the predictors include the Unemployment ratio, P, R, M, GNU, and L. The R-squared in this model is 93.8%, revealing significant relationships between W, P, Unemployment ratio, and M. Notably, we deem the impact of GNU as not significant, suggesting it does not exert a substantial influence on money wages.

Keywords:1, Structural Equations,2, Simultaneous Equations,3, Money Wages, Least Squares, 4,Two Stage Weighted Least Squares, 5,Two Stage Least Squares.

1: Introduction

Simultaneous equations, as mathematical models, play a crucial role in studying various economic phenomena. The future trajectory of frontier growth remains uncertain and challenging to predict, given the fluctuating stability of factors such as Foreign Direct Investment (FDI) and government expenditure. Economic growth experiences fluctuations over time, and despite empirical studies emphasizing growth-driving factors, this research specifically considers variables like FDI and government expenditures as potential explanatory factors for Gross National Income (GNU) growth.
In adopting a novel economic approach, this study seeks to reconcile growth models with cross-country variable data, focusing on the dynamic and interconnected nature of economic variables. Charataareus et al. (2013), for instance, delved into the long-term movement of exchange rates derived from the purchasing power parity theory, utilizing simultaneous equations. The assessment of GNU growth commonly relies on the Gross Domestic Product, accounting for the value of final goods and services produced within a given period, along with grants and aid received by Jordan from other countries (Adghor et al., 2008).
Maintaining sustained increases in per capita output over time involves leveraging financial sources, employment opportunities, and affordable raw materials within the country (Godwin, 2017; Isaac.D. Essi, 2017). This comprehensive study aims to shed light on the complex interplay of factors influencing Jordan's economic development, including sectors such as economic services, transportation, industry, agriculture, tourism, and communications. The country's attractiveness to foreign investment capital adds another layer of significance to its economic progress, requiring a nuanced understanding of the intricate relationships between diverse variables.
In this study, we employed the Vector Autoregression (VAR) model to delineate a dynamic simultaneous equations model, capturing the intricate interrelationships that underlie Jordan's success in enhancing various sectors. The nation has made significant strides in economic services, transportation, the industrial sector, and agriculture, as well as in areas like tourism and communications. Jordan's allure for foreign investment capital has spurred many studies aimed at evaluating the country's economic development.
Utilizing a comprehensive framework akin to a simultaneous equation system, we assessed the complex interactions between variables that contribute to Jordan's economic landscape. Building on insights from the Organization for Economic Co-operation and Development (OECD, 2006), which posits a positive role for openness, physical infrastructure, and technological advancements in enhancing productivity and, consequently, fostering economic growth.

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Benede–Nabende and Ford (1998) conducted estimations using the Three-Stage Least Squares (3SLS) system and the Generalized Method of Moments (GMM) to analyze a dynamic system. They highlighted the multiplier effects, with a particular emphasis on variables influencing real aggregate output and Foreign Direct Investment (FDI). In a study by Molipi and Nghelesce (2009), we examined the complexity of specific local development processes, employing statistical models with simultaneous equations. Notably, authors such as Kaufman (2002) and Matei and Oancea (2009) addressed issues related to corruption and the performance of public-sector health services.

Gemma (2003) asserted that economic growth results from the combined activity of aggregate government expenditure and Foreign Direct Investment (FDI), both of which rapidly stimulate economic growth. We posit higher levels of government consumption to enhance employment, profitability, and investment in a country's economy. Government consumption contributes to increased overall consumption levels, elevating demand and, depending on the size and effectiveness of expenditure multipliers, raising output.

We have considered public expenditure a potent economic force in modern society (Arrow and Kurz, 1980). However, Tumovsky (2004) introduced a contrasting perspective, indicating a negative relationship between economic growth and government consumption while asserting a positive link between economic growth and overall government spending. This perspective aligns with findings from studies like Grier and Tulloc (1987) and Folster and Herrekson (2001), which reported a non-robust relationship between government expenditure and economic growth.

Baro (1990) challenged the implicit assumption that all government expenditure is productive, emphasizing the need for careful consideration of the relationship. Previous studies, such as Kneller et al. (1998) and Landau (1983), employed various models, including the Generalized Least Squares (GLS) estimation technique. Landau (1983) concludes that increasing government spending on consumption hurts economic growth. Kormandi and Maguire (1985), using panel data from developed countries, supported this view, concluding that government expenditure has a negative but significant effect on economic growth. Increasing Foreign Direct Investment (FDI) has demonstrated a positive impact on economic growth. An effective government development policy should aim for high growth, considering available resources, addressing income inequality, and tackling corruption in financial and monetary policies (Sakib, 2011). Mishra (2011) utilized cointegration tests and vector error correction regression to study the relationship between consumption expenditure and economic growth for the period 1950-2008. Tapping and Hepsage (2014) employed panel data analysis to investigate household consumption.

Noureddine Krichen (2005) applied a simultaneous equation model to analyze the world crude oil and natural gas market. The model considered variables such as the market power of producers, price volatility following shocks, and the influence of crude oil prices. Simultaneous equation models are designed to establish connections between endogenous and exogenous variables. The model equations utilized for this purpose are as follows:

Simultaneous equation models typically include three types of equations:

1. **Definition Equations:** These lay out the fundamental definitions for the variables involved.
2. **Balance Sheet or Equilibrium Equations:** These express the equilibrium conditions in the model.
3. **Behavioral Equations:** These describe the behavior of economic agents and the relationships between variables.

Simultaneous equation models exhibit varying complexities, with some comprising over 10 behavioral equations, over 9 equilibrium equations, and definition equations. The predominant method for solving these models is the two-stage least squares method, as noted by Andrei (2008). This method is favored for addressing circularities in the model and has the advantage of mitigating autocorrelation problems in residuals.

Ovenserio Friday (2016) conducted a study analyzing the relationship between foreign direct investment (FDI), public expenditure, and economic growth in Nigeria. The findings suggested that infrastructure, measured by generation, significantly contributes to stimulating economic growth and FDI. In a different approach, Hsich and Lai (1994) employed vector autoregressive (VAR) modeling among G-7 countries. Their analysis revealed a lack of uniform causality between dependent and independent variables in the time series data.

These studies collectively demonstrate the diverse methodologies applied in examining the intricate relationships within simultaneous equation models across different economic contexts. In the exploration of simultaneous equation models, researchers like Lin (1994) have employed various estimation methods, including ordinary least squares (OLS), two-stage least squares (2SLS), and three-stage least squares, to analyze data from 62 countries. Lin's findings suggested that government spending has marginal effects on economic growth.

Hsia and Zhang (2013) emphasized the importance of assessing whether a consistent estimator is asymptotically biased, highlighting its crucial role in ensuring the validity of statistical inference. Hepsay (2014) delved into the analysis of household consumption expenditure in the EA-18 region, utilizing panel data from 2000 to 2012. Their use of the Driscoll Kraay test revealed some deviations from assumptions, adding nuance to interpreting the results.

Akekera and Yousuo (2012) focused on dynamic simultaneous equations, employing the Generalized Method of Moments (GM) method. They concluded that the statistical properties of their estimation critically depend on the behavior of sample size (N) or periods (T) as they approach infinity. These studies collectively contribute to the understanding of the intricate relationships within simultaneous equation models. Akekera and Yousuo (2012) examined the influence of income

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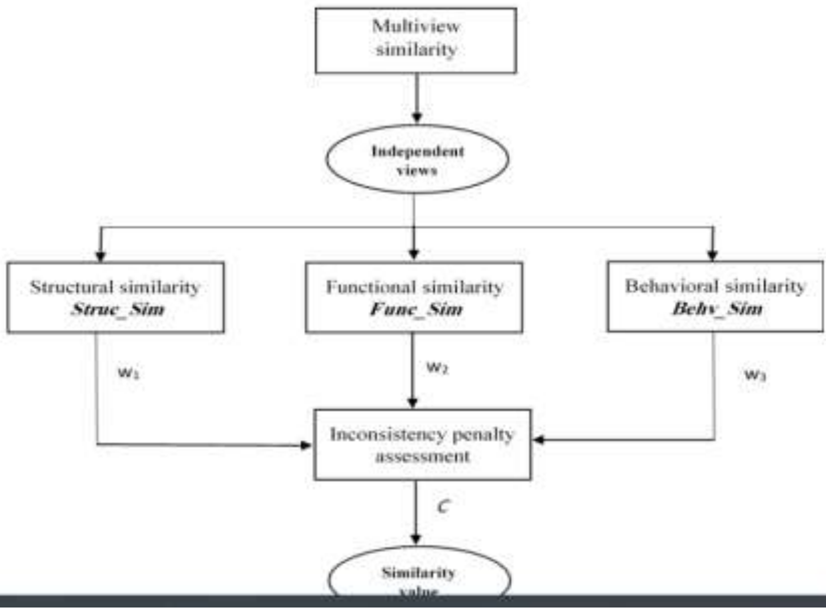
changes on private consumption expenditure in Nigeria using least squares regression. Their study revealed a positive impact of Gross Domestic Product (GDP) on private consumption. In a similar vein, Hepsag (2014) conducted a study using panel data from EA-18 countries spanning 2000–2012. The results, based on the Driscoll Kraay test, indicated a deviation from assumptions. However, the findings suggested a meaningful and 99% positive level, with an increase in GDP correlating with a $0.566 rise in household consumption. These studies contribute valuable insights into the relationship between income, consumption, and economic dynamics in specific contexts.

3. The objectives:
The primary objective of this paper is to investigate whether the Jordanian economy has achieved full employment and to assess its impact on wage determination. Also, the study aims to achieve the following objectives:
1. Examine the trajectory of money wages within the Jordanian labor system and their correlation with other influential variables, such as government expenditure.
2. Evaluate the influence of affluence on Gross National Utility (GNU), government expenditure, consumption, investment, prices, and resource prices.
3. Conduct a comparative analysis between two stages of least squares and weighted least squares methodologies.
By addressing these objectives, the study seeks to provide insights into the current state of the Jordanian economy, particularly in terms of employment and wage dynamics, while employing robust statistical methodologies for analysis.

Hypotheses: -
The hypotheses of this study are as follows:
1. $H0:\beta1=0$ - The price of commodities does not significantly influence the money wages of labor and Gross National Product (GNP) in Jordan.
2. $H0:\beta2=0$ - The resource prices do not significantly impact usage and full employment in Jordan.
3. $H0:\beta3=0$ - Government expenses do not significantly influence full employment in Jordan.
4. $H0:\beta4=0$ - Total consumption does not significantly affect the money wages in Jordan.
5. $H0:\beta5=0$ - The level of prices in Jordan does not significantly influence money wages and full employment in the economy.
6. $H0:\beta6=0$ - The unemployment ratio during the study period does not significantly impact full employment and does not affect money wages.
7. $H0:\beta7=0$ - Investment finance does not significantly influence full employment and does not impact money wages.

These hypotheses will be tested to assess the significance of various factors on the economic variables under consideration in the study.

II: Literature review
We can compute the simultaneous equations, as illustrated in diagram 1 below:



The computation of structural similarity involves the integration of concept similarity and relationship similarity, as depicted in the figure. Various authors employ diverse simulation models and economic methodologies. For instance, Anderson and Rubin (1994) estimated the structural equation, incorporating additional equations within their study system. It is pertinent to consider dynamic simultaneous equations without loss of generality: $\beta\gamma_i t + ƛ\gamma_{t-1} + C_{2it} = \pi_i + L_{it}$ ………………(1)

Where γ_{it}, γ_{2it}, ……$\gamma_{it}n$)[1], are G×1 vector of countered peroneus and lagged Joint dependent variables, and í= 1,000 N,t= 1,000, T . G×1 is a vector of time-invariant of individual-specific effects.

III-: MATERIAL AND METHOD:

1 . IDENTIFICATION OF SIMULATION EQUATION

Under the aforementioned dynamic simultaneous equation characterized by linearity, one can eliminate specific effects through the utilization of the first difference of an individual's time series observation (Anderson and Hsiao, 1982). Researchers have also considered other methods, such as forward demeaning employed by Alvares and Arellano (2003) and long differencing employed by Grasseth (2011). The efficiency of the estimator may depend on how the individual-specific effects are removed, depending on the relevant moment condition.

Both long-difference systems (expressed as γít = γít – γí0) and first-difference systems (expressed as Δγít = γit - γít-1) can be viewed as complete systems, assuming that the data generating process (DGP) of γí0 is not different from γít. Hsiao (1983) demonstrated that the necessary and sufficient condition for the identification of the g-equations is given by rank (B_g, $Tí_g$, C_g) = G-1. In their study, Hsiao and Perrigne (2005) considered the consistent estimation through the GMM method or quasi-maximum likelihood, establishing the relationship between the reduced form parameters and structural form parameters. Following the same logic, one can remove individual-specific effects by first differencing the equation below.$\gamma_{1ít} = a\,\gamma_{2ít} + \gamma_1\,\gamma_{1,ít-1} + ℸ_1 ℸ_{,it}\text{-}1 + \Sigma^1{}_1 X_{lit} + 4_{lit}$ …………(2)

$\gamma_{2it} = Tl_{21}\,\gamma_{lit}\ \text{-}1 + 1ℸ_{2\text{-}2}\gamma_{2it-1} + 1ℸ_{234}X_{2it} + 1ℸ_{2i} + 4_{2it}$

$\gamma_{2it}\quad + 1ℸ_{2i} + 4_{2it}$. ………….(4)

where: $X_{i1}t$ and $X_{2i}t$ are vector.K1, X1, and K_2*1 vectors of included and excluded exogenous variables in the system model. $\gamma_{2i}t$, is a (G-1)* 1 vector included dependent variables. Therefore we can specify the model specification as:

G_{n4} = $W_{t,}\, W_{t-i}$) + R_t ……………(5)

W_t = f(G_{N4},W_{t-1},W_t + R_1) …….(6)

A_t = G_{uN} + W_t …………..(7) (Koutsoyianis,2003)

The variables in the above equations can written as:

$G_{n4} = \tau_0 + \tau_1 w_t + T_2 W_{t-1} + U_í t_í$ …………(8)

$Wt = \theta_0 + \theta_1 G_{NU} + \theta_2 W_{t-1} + \theta_3 W_t + U_2 = G_{NU} + W_t$ …………(9)

R_1 = vector of other variables which impacted the GNU and impacted the W_t.

3 -2: Augmented Dicky- Fuller test

The Augmented Dickey-Fuller unit root test for the data can be formulated as$\Delta G_{NU} = a_0 + bG_{Nut-1} + \sum_{t=1}^{m} pi\Delta Gnut - i$

$\Delta W = a_0 + b_i\, w_{t-1} + \sum_{i=1}^{m} pi0\ wt - i + ui$

$\Delta_{unemp} = a_0 + b_i\, unept\text{-}1 + \sum_{e-1}^{n} pi\ \Delta\ une + ui$

$\Delta_{mt} = a_0 + b_i M_{t-1} + \sum_{t=1}^{m} pi\Delta\ \ Mt - 1 + ui$

$\Delta R_t = a_0 + b_i R_{t-1} + \sum_{t=1}^{m} pi\Delta Rt - 1 + ui$

$\Delta l = a_0 + b_i l_{t-1} + \sum_{t=1}^{m} pi\ \Delta lt - i + ui$

Where: T is the time trend, Δ is the difference operator, and m number of legs of difference. While P: average changes in prices. R: is the Average of raw material prices, L: is the changes in power prices. $_{GNU}$: is the gross national income .t: is the time trend, a is the parameter to be determined, and pi is the coefficient of preceding observations. The mode of estimators is the Phillips model and the Keynesian Gnu model.

2: Data Collection :

The data for this study was gathered from various sources. Time series data on Gross National Product (GNP) in million J.D. were obtained from the Central Bank of Jordan (CBJ) statistical bulletins. Information on commodity price levels was sourced from the statistics department census, while data on raw material prices were extracted from International Monetary Fund (IMF) reports. Unemployment statistics were collected from Arab Economic Unified reports, and wage data were sourced from labor bulletins and the statistics department in Jordan.

The selection of variables in this study was deliberate, focusing on those that were deemed significant while excluding others that were considered ineffective. This decision was made in consideration of government monetary and financial policies. It is essential to note that non-stationary series can lead to spurious regression. Therefore, we used one variable in levels with two-stage least squares (2SLS) to achieve efficiency in the first difference. The effectiveness of this approach depends on two key assumptions. Firstly, the variance-covariance matrix of the exogenous variables converges to a non-singular matrix. Secondly, the roots of the companion matrix of the dynamic system are all less than one in absolute value, equivalent to the number of cointegration equations.

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3: Methodology
The primary method employed for data analysis involved the use of economic tools. Initially, the data underwent stationarity tests using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. Subsequently, cointegration tests were applied. We examined the specification of the models using the Hausman test for simultaneity, focusing primarily on comparing two-stage least squares (2SLS) and weighted least squares analyses.
The models and their specifications were divided into two parts: the first model represented Gross National Product (GNP) and its influenced variables, while the second model focused on W* (the money wages of labor) in Jordan and its influenced variables. The liability test was conducted to assess the models. Time series data often show non-stationarity, so we used 1-unit root tests to address this issue since the stationarity of the series can greatly affect their behavior. To prevent spurious regression results (Gujarati, 2013), we chose not to use non-stationarity.

IV: DATA ANALYSIS:
QUANTITATIVE DATA ANALYSIS :
-1: Unit root test

Table 1: Unit root test for variables

Variables	Levels ADF / PP	1st difference ADF / PP	Order of integration
Et (consumption)	-4.056 / -3.403**	-10.679** / -9.876***	1(1)
Exp(expenses)	-2.637 / -1.948	-4.469*** / -3.921***	1(1)
M	-3.108* / -0.874**	-2.558* / -1.945	1(2)
L	-2.692 / -2.043	-6.754***/-6.098***	1(1)

***, **, * represent the significant levels 10%, 5% and 1%.

We reject the null hypothesis of a unit root in favor of the stationary alternative in each case if the test statistic is more negative than the critical value. However, the rejection of the null hypothesis does not imply the absence of a unit root. At this level, the null hypothesis of a unit root was accepted. According to the results in the table, all variables were stationary at order 1, except for the prices of M, which were stationary at level 2.
-2: Cointegration test

Table 2: Johansson Co-integration test.

Wt model

Hypotheses	Eigenvalue	Trace	Crist 0.05	Probe	Max-Eigen	Crist 0.5	probe
None*	0.58631	42.9375	27.6977	0.0005	35.66924	19.8721	0.001
At most1 *	0.20692	8.1614	13.4892	0.2876	7.63131	12.6235	0.2956
At most2 *	0.02483	0.64352	3.0764	0.31542	0.68173	2.68702	0.3451

The trace test suggests a cointegration equation at a 5% significance level, while the Max-Eigen value test also indicates one cointegration equation at the 5 percent level.
Ho 1: No cointegration Equation: Trace statistic 42.94 > 27.698
The hypothesis of non-counteraction is rejected.
Ho 2: No counteraction equation: Trace statistic 35.669 > 19.87.
The hypothesis has at most 1 counteraction.
In the subsequent step, the dependent variable regresses on the fitted values of the suspected endogenous variable and the residuals from the first stage of regression. The conclusive results indicate that other exogenous variables significantly influenced the fitted money wage model, and the residuals (ut) have a significant effect on money wages. These exogenous or explanatory factors are considered exogenous.3-3-3: Two least square

3-: The dependent variables: GNU.

Table 3 model summary:
Model Summary: Dependent variable GNU
Model Summary

Equation 1	Multiple R	.988
	R Square	.976
	Adjusted R Square	.964
	Std. Error of the Estimate	48.682

R^2 squared, multiple R, and R^{-2} are high results, near 96%, where the St/error of the estimate is (48.68).

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Table 4 Coefficient Correlations of 2SLS

Dependent variable: GNU

			W	P	UNEMPLO	R	M
Equation 1	Correlations	W	1.000	.516	.763	.230	-.906-
		P	.516	1.000	.580	.264	-.624-
		UNEMPLO	.763	.580	1.000	.207	-.948-
		R	.230	.264	.207	1.000	-.306-
		M	-.906-	-.624-	-.948-	-.306-	1.000

The correlation matrix reveals weak relationships between R and W, R and P, as well as R and unemployment. The relationship between R and other variables exhibits weak associations. In contrast, other variables demonstrate strong or moderate relationships, indicating favorable connections. However, M predominantly displays inverse relationships with the variables in the model.

Table 5: Coefficients of model variables

		Unstandardized Coefficients (dependent variable (GNU)				
		B	Std. Error	Beta	t	Sig.
Equation 1	(Constant)	228.756	237.519		.963	.358
	W	1.441	1.815	.152	.794	.446
	P	.353	1.184	.019	.298	.772
	UNEMPLO	14.698	9.884	.385	1.487	.168
	R	-.145-	.668	-.013-	-.217-	.833
	M	67.421	58.930	.480	1.144	.279

The model is:

The model equation, GNUt = 228.756 + 1.44W + 0.359P + 14.698 unemployment - 0.145R + 67.421M, indicates that none of the variables in the model are statistically significant based on the t-test and probability values. The t-test and probability values indicate that none of the variables in the model are statistically significant, suggesting that the Jordanian economy is not fully utilizing these variables and operating at full employment of economic resources. The standard error of the model does not have an impact on the results.

Table 6: ANOVA analyses of GNU with affected variables

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	Regression	956215.099	5	191243.020	80.696	.000
	Residual	23699.205	10	2369.921		
	Total	979914.304	15			

The table indicates that the sum of squares of the regression is relatively high at 956215.099. The F-statistic is 80.696, with a probability value of 0.000. This suggests that the model using two least squares for GNU and the affected variables is well-fitted, and the results are statistically significant.

4 : Two stages least squares with dependent variable W

The model used as instrumental variable L, the summary results are in table (7)

Table 7: Model Summary of W as a dependent variable

Equation 1	Multiple R	.968
	R Square	.938
	Adjusted R Square	.906
	Std. Error of the Estimate	8.226

The results indicate a high level of R-squared (R^2), adjusted R-squared ($\bar{R}^2$), and correlation coefficient (R) in the GNU model. However, the standard error is relatively low, even lower than in the GNU model.

Table 8: Coefficient Correlations of the model -W as the dependent variable

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			P	UNEMPLO	R	M	GNU
Equation 1	Correlations	P	1.000	.295	.178	-.289-	.040
		UNEMPLO	.295	1.000	-.003-	-.205-	-.386-
		R	.178	-.003-	1.000	-.241-	.125
		M	-.289-	-.205-	-.241-	1.000	-.804-
		GNU	.040	-.386-	.125	-.804-	1.000

The table illustrates a weak relationship between M and all variables in the model, as well as between R and all variables in the model. There is only a strong inverse relationship between M and GNU. This suggests that the level of money wages in Jordan may be relatively low, which may not be sufficient to adequately address the economic conditions in the country.

Table 9: Coefficients of the W model

		Unstandardized Coefficients				
		B	Std. Error	Beta	t	Sig.
Equation 1	(Constant)	110.610	23.171		4.774	.001
	P	-.331-	.172	-.173-	-1.932-	.082
	UNEMPLO	-4.514-	1.170	-1.125-	-3.858-	.003
	R	-.074-	.111	-.063-	-.665-	.521
	M	24.898	7.082	1.687	3.516	.006
	GNU	.041	.052	.391	.794	.446

W = 110.61 – 0.331P -4.514 Unemployed – 0.74 R+24.898M +0.04 GNU
The standard errors for all variables are relatively low. The constant is 110.61, and P is significant at the 10 percent level, unemployment at the 1 percent level, and M at the 10 percent level. However, R and GNU are not statistically significant in this model.

Table 10: ANOVA analyses for W model

		Sum of Squares	df	Mean Square	F	Sig.
Equation 1	Regression	10163.860	5	2032.772	30.038	.000
	Residual	676.729	10	67.673		
	Total	10840.589	15			

Based on the model results, the sum of squares of regression is 10163.860, and the F-Statistics is 30.038, with a probability level of 0.00. This indicates that the model fits the data well.
5 : Weighted least square analyses
1- GNU (as dependent variable):
We selected the corresponding power for further analysis because it maximizes the log-likelihood function (-78.475).

Table 11: Model Summary of GNU

Multiple R	.994
R Square	.987
Adjusted R Square	.979
Std. Error of the Estimate	813.871
Log-likelihood Function Value	-78.475-

The multiple R is 0.994, indicating a strong overall relationship. The adjusted R square is 0.979, while the R-squared value is 0.987. These results suggest significant relationships between the dependent variables and the predictors in both directions. The log-likelihood maximizes the model function at 78.475.

Table 12 Coefficients of the GNU model

	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	Std. Error	t	Sig.
(Constant)	436.829	215.405			2.028	.073
W	1.040	1.648	.096	.152	.631	.543
P	-.074-	.879	-.004-	.051	-.084-	.935
UNEMPLO	14.207	8.018	.416	.235	1.772	.110

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R	.972	.647	.121	.080	1.502	.167
M	93.787	47.930	.670	.342	1.957	.082
L	-24.803-	11.044	-.271-	.121	-2.246-	.051

The estimated model results are as follows:
W = 438.829 – 1.04W – 0.74P + 14.207 unemployed + 0.972R + 93.787M - 24.805L

The standard errors are low and significant. There is an inverse relationship between GNU and W, P, and L, while there is a proportional relationship between GNU and Unemployment, and M. M and L are significant at the 10 percent and 5 percent levels, respectively, whereas other variables are not significant. This suggests an incomplete utilization of resources in the Jordanian economy.

Table 12: ANOVA analyses of GNU as dependent variables

	Sum of Squares	df	Mean Square	F	Sig.
Regression	467560224.686	6	77926704.114	117.645	.000
Residual	5961480.863	9	662386.763		
Total	473521705.548	15			

The results in the table indicate that the model fits the data well, as evidenced by the F-statistics of 117.845 with a probability level of 0.000.

II: W (money wages as dependent variables)
The corresponding power is selected for further analysis because it maximizes the log-likelihood function (-55.559).

Table (13: Model Summary of w dependent variable

Multiple R	.983
R Square	.966
Adjusted R Square	.944
Std. Error of the Estimate	.333
Log-likelihood Function Value	-49.565-

The multiple R stands at an impressive 98%, signifying robust relationships among the variables in the model. The R squared value of 96.6% illustrates the extent to which the determinant explains the variation occurring in the explanatory and dependent variables. With a standard error of 0.333, the model remains unaffected. Additionally, the log-likelihood function value is recorded at -49.565.

Table 14: Coefficients of the W model

	Unstandardized Coefficients		Standardized Coefficients			
	B	Std. Error	Beta	Std. Error	t	Sig.
(Constant)	36.492	29.702			1.229	.250
R	-.474-	.217	-.254-	.117	-2.178-	.057
M	17.467	5.865	.994	.334	2.978	.015
L	8.959	3.716	.546	.227	2.411	.039
UNEMPLO	-6.249-	1.136	-1.136-	.206	-5.503-	.000
P	-.265-	.164	-.115-	.071	-1.613-	.141
GNU	.087	.036	.699	.292	2.391	.040

The model is expressed as follows:
W = 36.492 - 0.474 R + 17.467M + 8.959L – 6.249 Unemployment – 0.265P + 0.087GNU
The table results reveal an inverse relationship between W and Unemployment, as well as W and P. Conversely, there are proportional relationships between W and M, L, and GNU. The standard error remains unaffected by the variables due to its small value. The t-ratio indicates significance at a 5% level with Unemployment, R, and GNU, but at a 1% significant level with M. Other variables, such as P, are not considered significant.

Table 15: Hausmann test specification of simultaneity showing the exogenous variables (W).

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Variables	coefficients	St/Error	metastasis	Probe level
Contents	4.6819	3.6711	0.3654	0.6932
Rt	0.0932	0.1786	0.02632	0.8997
Lt	0.6431	0.4558	0.3698	0.000
Mt	2.6754	1.7783	8.5441	0.0512
expense	16.282	3.4761	1.9872	0.0436
Ct	9.8351	2.9453	0.6769	0.0814
L-1	-0.0512	0.0016	-4.3091	0.000
M-1	-1.7448	0.0023	-3.1615	0.006
Exp-1	-5.6332	0.0157	-2.6774	0.000
e-1	-3.4765	0.3643	-1.5981	0.0012
w	15.7139	6.9543	2.7563	0.048

R^2 (squared) 0.897 adjusted R2 0.854
F-statistic 1049.567 probe (F-stat) 0.076

The Hausmann specification model is represented as follows:
$W_t = 4.6819 + 0.0932R_t + 0.6431L_t + 2.6754M_t + 16.28expense + 9.8.5Ct - 0.512L_{t-1} - 5.633expense_{t-1} - 3.476C_{t-1}$The regression model is deemed acceptable, illustrating the impact of exogenous variables on endogenous variables. Table () presents the results for GNU as the dependent variable, with the model as follows:
$GNU = 1265.508 + 700.419R_t + 0.723C_t + 0.163exp$
The first error of the GNU model is 813871, while for the weighted least square model with the dependent variable W, the first error is 8333. In the 2-SLS model with GNU as the dependent variable, the standard error is 48.682. Conversely, when the dependent variable is W, the standard error is 8.226. Consequently, it is observed that 2 SLS is more efficient for both dependent variables. However, it is challenging to definitively state its superior efficiency (asymptotically) compared to OLS or weighted least squares due to the presence of a contemporaneous covariance structure between the error terms in each structural equation.

V: CONCLUSION
In conclusion, this study has navigated the complexities of simultaneous equation modeling to unravel the dynamics between money wages, labor, and Gross National Income (GNU) in Jordan from 2006 to 2022. Drawing on a rich dataset from sources such as the Central Bank of Jordan and IMF reports, the research employed advanced statistical methods like two-stage least squares and weighted least squares.
The findings shed light on the significant influences of variables like unemployment, government expenditure, and commodity prices on both money wages and overall Gross National Income. The nuanced relationships uncovered underscore the intricacies of resource employment in the Jordanian economy. The Hausmann test further affirmed the interconnectedness of exogenous and endogenous variables.
While providing valuable insights, it's crucial to acknowledge the inherent limitations and complexities in economic modeling. This study contributes to the ongoing discourse on Jordan's economic landscape, offering a foundation for future research and policy considerations. The simultaneous equation modeling approach proves robust, offering a lens to better understand and navigate the intricate dynamics within economic systems.

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