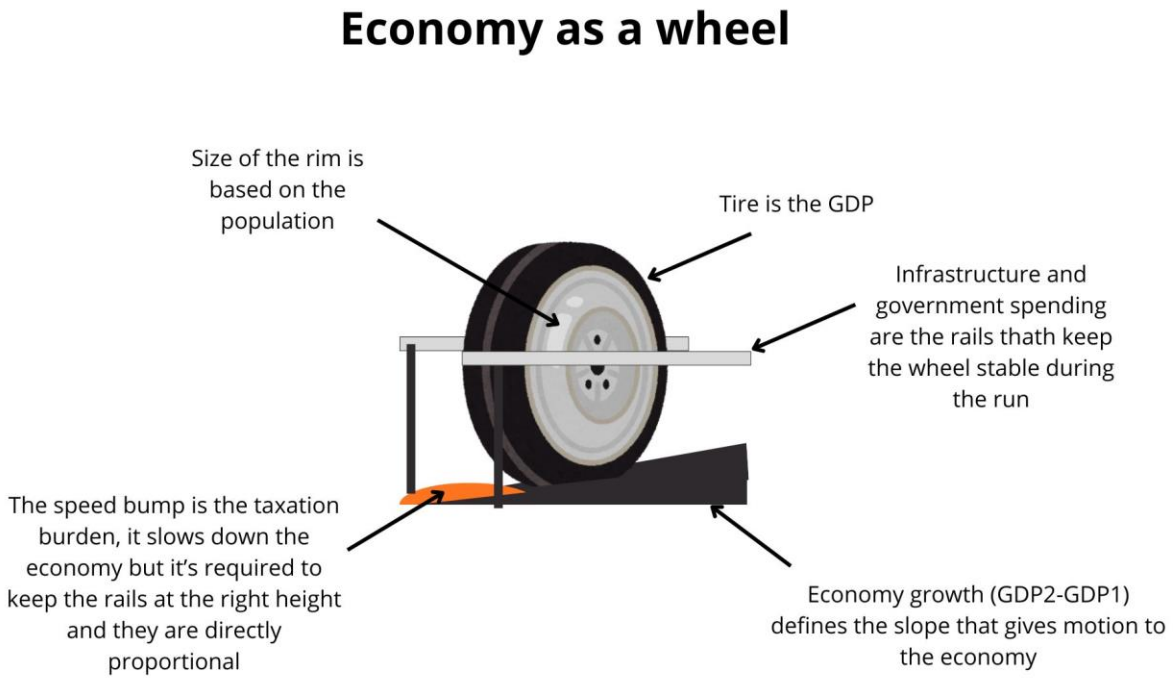
The Cipriani Economic Model: A Framework

for Measuring fiscal Efficiency

Abstract

The Cipriani Economic Model is a theoretical framework with empirical application designed to measure fiscal efficiency beyond traditional indicators such as GDP. The model integrates population, growth rate, taxation, infrastructure spending, and economic circulation into a unified framework. It evaluates not only economic output but also the balance between motion and friction within an economy highlighting the importance of efficiency, sustainability, and stability instead of constant growth.



Core Formulation

Primary Model: $M = Y \times g \times (1 - (T + S) - n)$

Efficiency Model: $E = g \times (1 - (T + S) - n)$

Trend: $De = E(t) - E(t-1)$

Sp = Share of the largest contributing sector to GDP

All variables except Y are expressed as decimal ratios.

Y (Gross Domestic Product): Total economic output of a state or country in a given year, measured in trillions of U.S. dollars. It represents the size of the economy.
g (GDP Growth Rate): The annual percentage increase in GDP, calculated as (GDP t – GDP t-1) / GDP t-1). It represents economic expansion speed.
T (Tax Burden): Total tax revenue collected by state and local governments divided by GDP. It measures how much of the economy is extracted through taxation.
S or Ggov (Government Spending Ratio): Total public expenditure divided by GDP. It represents the share of economic output redistributed or consumed by the government.
n (Population Growth Rate): Annual population increase, calculated as ((Population t – Population t-1) / Population t-1). In this model, it is interpreted as a proxy for short-term fiscal pressure due to delayed tax contribution.
M (Momentum Score): The final output of the model represents total economic growth in monetary terms adjusted for systemic slowing factors, capturing the balance between economic expansion and structural pressures within the economy.
E (Efficiency Score): A normalized version of the model independent of GDP size, used for comparing states or countries, it represents the net economy growth.
De (Efficiency Trend): The change in efficiency between two time periods, capturing improvement or deterioration.

Computation Methodology

Y is obtained from official GDP datasets (e.g., BEA).
g is computed using year-over-year GDP growth.
T is calculated as total tax revenue divided by GDP.
S is calculated as total government spending divided by GDP.
n is computed using population growth data from census sources. All variables must be expressed in consistent units.

Interpretation of the Model

The model (E) measures how much economic growth remains after accounting for fiscal and demographic pressures. A higher value of E indicates stronger economic performance relative to fiscal burden. A negative value indicates that fiscal and demographic pressures outweigh economic growth. The preferred condition is an E value close to zero but positive, representing a balanced alignment between economic expansion, infrastructure capacity, and population dynamics.

Optimal Growth Condition

The optimal condition is defined when E is the closest value to zero while remaining positive. This represents a balance where economic growth is sufficient to sustain fiscal obligations without excessive expansion. If E is too large, it indicates inefficient overexpansion relative to state structure resources. If E is negative, it indicates unsustainable fiscal pressure for the taxpayers. Therefore, the ideal state is a controlled equilibrium where growth matches fiscal demand.

Reversed (Optimization) Formulas

g = (M / Y) / (1 - (T + S) - n)
T + S = 1 - n - (M / (Y × g))
n = 1 - (T + S) - (M / (Y × g))

These allow policymakers to determine required adjustments in growth, taxation, spending, or population dynamics.

TEXAS

Y = GDP
GDP 2007 = 1.20 trillions

GDP 2008 = 1.253 trillions
GDP 2023 = 2.64 trillions
GDP 2024 = 2.76977 trillions

gY = GDP growth rate

2008 = 0.045
2024 = 0.0492

T = Total tax revenue / GDP

Tax revenue 2008 = 41.36 billions
Tax revenue 2024 = 81.87 billions
2008 = 0.033
2024 = 0.0295

S = Total spending / GDP

Total spending 2008 = 83.5 billions
Total spending 2024 = 212.1 billions
2008 = 0.0666
2024 = 0.07657

n = Population growth

2008 = 0.0196
2024 = 0.0183

Using the formula: $E = g \times (1 - (T + S) - n)$

E 2008 = 0.045 * (1 – (0.033 + 0.0666) – 0.0196) = **0.0396**
E 2024 = 0.0492 * (1 – (0.0295 + 0.07657) – 0.0183) = **0.0431**

This comparative application of the model shows that it can be applied to any state and would create an efficiency numerical standard that doesn't variate based on the size of the economy. To ensure a proper adjustment of a state's efficiency is needed the Motion formula: M = Y * g * (1 – (T + S) – n)

M 2008 = **0.0497**
M 2024 = **0.1192**

While Texas maintains positive fiscal-adjusted momentum in both periods, the increase in E from 2008 to 2024 suggests a growing divergence from the model's optimal equilibrium condition.

CALIFORNIA

Y = GDP

GDP 2007 = 1.9 trillions
GDP 2008 = 1.946 trillions
GDP 2023 = 3.827 trillions

GDP 2024 = 4.048 trillions

g = GDP growth rate

2008 = 0.02421

2024 = 0.0618

T = Total tax revenue / GDP

Tax revenue 2008 = 101.28 billions

Tax revenue 2024 = 265 billions

2008 = 0.052

2024 = 0.0647

S = Total spending / GDP

Total spending 2008 = 195.48 billions

Total spending 2024 = 494.10 billions

2008 = 0.1004

2024 = 0.1204

n = Population growth

2008 = 0.0116

2024 = 0.0059

Using the formula: $E = g \times (1 - (T + S) - n)$

E 2008 = **0.0202**

E 2024 = **0.05**

To ensure a proper adjustment of a state's efficiency is needed the Motion formula: M = Y * g * (1 – (T + S) – n)

M 2008 = **0.0394**

M 2024 = **0.2024**

Although California's efficiency increased significantly over time, the corresponding increase in momentum suggests a growing divergence from the model's equilibrium condition, driven primarily by higher economic expansion relative to fiscal structure.

NEW YORK

Y = GDP

GDP 2007 = 1.111 trillions

GDP 2008 = 1.1079 trillions

GDP 2023 = 2.183 trillions

GDP 2024 = 2.322 trillions

g = GDP growth rate

2008 = -0.00279
2024 = 0.06396

T = Total tax revenue / GDP

Tax revenue 2008 = 58.5 billions
Tax revenue 2024 = 103.3 billions
2008 = 0.0528
2024 = 0.0445

S = Total spending / GDP

Total spending 2008 = 116.1 billions
Total spending 2024 = 234.9 billions
2008 = 0.1048
2024 = 0.1012

n = Population growth

2008 = 0.0051
2024 = 0.01086

Using the formula: $E = g \times (1 - (T + S) - n)$

E 2008 = **-0.00235**
E 2024 = **0.05398**

To ensure a proper adjustment of a state's efficiency is needed the Motion formula: M = Y * g * (1 – (T + S) – n)

M 2008 = **-0.00259**
M 2024 = **0.12533**

New York exhibits a transition from negative to positive fiscal-adjusted performance between 2008 and 2024, reflecting a shift towards a positive but potentially above-equilibrium growth condition

FLORIDA

Y = GDP

GDP 2007 = 0.7819 trillions
GDP 2008 = 0.7674 trillions
GDP 2023 = 1.625 trillions
GDP 2024 = 1.727 trillions

g = GDP growth rate

2008 = -0.0186
2024 = 0.0628

T = Total tax revenue / GDP
Tax revenue 2008 = 34.1 billions
Tax revenue 2024 = 63.1 billions
2008 = 0.0444
2024 = 0.0365
S = Total spending / GDP
Total spending 2008 = 90.2 billions
Total spending 2024 = 158.5 billions
2008 = 0.1175
2024 = 0.0918
n = Population growth
2008 = 0.0070
2024 = 0.0156

Using the formula: $E = g \times (1 - (T + S) - n)$

E 2008 = **-0.01546**
E 2024 = **0.05376**

To ensure a proper adjustment of a state's efficiency is needed the Motion formula: M = Y * g * (1 – (T +S) – n)

M 2008 = **-0.01186**
M 2024 = **0.0928**

Florida exhibits a transition from negative to positive fiscal-adjusted performance, with a notably high efficiency level in 2024, although the elevated efficiency level may indicate potential overextension relative to structural capacity.

MONTANA

Y = GDP
GDP 2007 = 0.0361 trillions
GDP 2008 = 0.0370 trillions
GDP 2023 = 0.0747 trillions
GDP 2024 = 0.0784 trillions
g = GDP growth rate
2008 = 0.0253
2024 = 0.0502
T = Total tax revenue / GDP
Tax revenue 2008 = 2.44billions

Tax revenue 2024 = 5.49 billions
2008 = 0.0659
2024 = 0.0700

S = Total spending / GDP

Total spending 2008 = 5.36 billions
Total spending 2024 = 10.0 billions
2008 = 0.1449
2024 = 0.1275

n = Population growth

2008 = 0.0090
2024 = 0.0052

Using the formula: $E = g \times (1 - (T + S) - n)$

E 2008 = **0.01974**
E 2024 = **0.04003**

To ensure a proper adjustment of a state's efficiency is needed the Motion formula: M = Y * g * (1 – (T +S) – n)

M 2008 = **0.00073**
M 2024 = **0.00314**

Montana presents one of the clearest examples of near-equilibrium performance in the model. Although its absolute momentum remains small due to the size of its economy, its positive and low E values suggest a growth pattern that is closely aligned with its fiscal and demographic structure.

NEVADA

Y = GDP

GDP 2007 = 0.132 trillions
GDP 2008 = 0.1306 trillions
GDP 2023 = 0.2534 trillions
GDP 2024 = 0.2690 trillions

g = GDP growth rate

2008 = -0.0106
2024 = 0.0614

T = Total tax revenue / GDP

Tax revenue 2008 = 6.30 billions
Tax revenue 2024 = 10.5 billions
2008 = 0.0482
2024 = 0.0390

S = Total spending / GDP
Total spending 2008 = 14.1 billions
Total spending 2024 = 19.8 billions
2008 = 0.1080
2024 = 0.0736
n = Population growth
2008 = 0.0163
2024 = 0.0116

Using the formula: $E = g \times (1 - (T + S) - n)$

E 2008 = **-0.00877**
E 2024 = **0.05378**

To ensure a proper adjustment of a state's efficiency is needed the Motion formula: $M = Y * g * (1 – (T + S) – n)$

M 2008 = **-0.00115**
M 2024 = **0.01447**

Nevada provides a key example of balanced high-growth performance with potential signs of structural overstretch, demonstrating that strong economic expansion can be achieved while maintaining proximity to the model's equilibrium condition.

ALASKA

Y = GDP
GDP 2007 = 0.0494 trillions
GDP 2008 = 0.0552 trillions
GDP 2023 = 0.0682 trillions
GDP 2024 = 0.0716 trillions
g = GDP growth rate
2008 = 0.1174
2024 = 0.0498
T = Total tax revenue / GDP
Tax revenue 2008 = 12 billions
Tax revenue 2024 = 3.8 billions
2008 = 0.2174
2024 = 0.0531
S = Total spending / GDP
Total spending 2008 = 9.6 billions

Total spending 2024 = 13.2 billions
2008 = 0.1739
2024 = 0.1843

n = Population growth

2008 = 0.0084
2024 = 0.0049

Using the formula: $E = g \times (1 - (T + S) - n)$

E 2008 = **0.0705**
E 2024 = **0.0377**

To ensure a proper adjustment of a state's efficiency is needed the Motion formula: $M = Y * g * (1 – (T + S) – n)$

M 2008 = **0.00389**
M 2024 = **0.00270**

Alaska demonstrates that equilibrium in the model is not driven by efficiency alone, but by the structural relationship between growth, fiscal pressure, and demographic dynamics.

ITALY (External test)

Y = GDP

GDP 2007 = 2.22 trillions
GDP 2008 = 2.42 trillions
GDP 2023 = 2.14 trillions
GDP 2024 = 2.20 trillions

g = GDP growth rate

2008 = 0.0901
2024 = 0.0280

T = Total tax revenue / GDP

Tax revenue 2008 = 1 trillion
Tax revenue 2024 = 711.4 billions
2008 = 0.413
2024 = 0.323

S = Total spending / GDP

Total spending 2008 = 1.18 trillions
Total spending 2024 = 1.199 trillions

2008 = 0.488
2024 = 0.545
n = Population growth
2008 = 0.0071
2024 = -0.0006

Using the formula: $E = g \times (1 - (T + S) - n)$

E 2008 = **0.00824**
E 2024 = **0.00371**

To ensure a proper adjustment of a state's efficiency is needed the Motion formula: $M = Y * g * (1 – (T + S) – n)$

M 2008 = **0.0200**
M 2024 = **0.00816**

Italy presents a low-efficiency, low-momentum structure. Although the model does not produce negative values for the selected years, the results suggest that the economy operates within a narrow margin between economic growth and fiscal pressure where high fiscal pressure leaves only a small portion of growth available for effective performance.

Policy Implications

Effective economic policy should not be oriented toward maximizing growth alone, but toward maintaining a balanced relationship between economic expansion, fiscal structure, and demographic dynamics. The empirical results demonstrate that states with similar levels of efficiency may exhibit significantly different degrees of structural balance, highlighting the necessity of a dual-dimensional policy approach.

High momentum (M) reflects strong economic performance relative to fiscal and demographic pressures, while efficiency indicates the system's distance from the optimal equilibrium condition. As a result, states exhibiting **high efficiency but elevated momentum**, such as California and Texas, should have as primary policy objective to reduce structural imbalance. In these cases, economic expansion is strong, but it is not fully supported by infrastructure, fiscal capacity, or institutional efficiency. Policymakers should therefore prioritize improving the absorptive capacity of the system through targeted infrastructure investment, reduction of administrative and regulatory bottlenecks, and enhancement of public spending efficiency. to align growth with the system's underlying capacity.

In contrast, states undergoing **recovery dynamics**, such as New York and Florida, require policies focused on consolidation and stabilization. Having transitioned

from negative to positive efficiency and momentum, these states must avoid both excessive fiscal expansion and premature contraction. Policy efforts should concentrate on maintaining sustainable growth trajectories, improving the efficiency of public expenditures, and ensuring that newly achieved balance is preserved over time.

States that are **close to equilibrium**, including Montana and Alaska, present a different policy challenge. In these cases, the system is already aligned with its structural constraints, and aggressive intervention may be counterproductive. The appropriate policy stance is one of restraint and preservation, focusing on maintaining fiscal discipline, avoiding unnecessary expansion of spending, and supporting incremental, productivity-enhancing growth. These states illustrate that optimal performance is not necessarily associated with high growth rates, but with structural alignment.

Particularly noteworthy is the case of Nevada, which demonstrates that **high efficiency and proximity to equilibrium can coexist**. This suggests that balanced high-growth systems are achievable when fiscal pressure, population dynamics, and economic expansion evolve in a coordinated manner.

More broadly, the model implies that economic policy should be **state-specific and structurally informed**, rather than guided by uniform growth targets. Policies aimed solely at increasing output may inadvertently generate overgrowth and then lead to hidden inefficiencies and long-term risks while overly restrictive policies may suppress growth unnecessarily in systems that are already well balanced.

The goal is not the maximization of growth, but the optimization of its structure. By targeting the equilibrium condition, policymakers can pursue a form of development that is both efficient and sustainable, ensuring that economic expansion remains aligned with the fiscal and demographic foundations upon which it depends.

This model demonstrates how a state’s policy should not be oriented toward maximizing growth alone, but toward aligning growth with fiscal and demographic capacity. In this framework, **the best-performing states are not simply those that grow the most, but those that remain closest to sustainable structural balance.**

Classification

Given the examples before, and by using the official state data, it is now possible to create a range of ideal, good and bad situations to classify and compare each state. This method can only be applied to E since the GDP would influence the result in favor of big economy states.
In order to create a general classification index, the necessity of data for all the states is the minimum requirement so, the list of the states with each E result is below:

State (2024)	Y in tr	g	T	S	n	E	M in tr
Alabama	0.3146	0.0369	0.0668	0.1084	0.0059	0.0302	0.0095
Alaska	0.0716	0.0498	0.0531	0.1843	0.0041	0.0378	0.00271
Arizona	0.5156	0.045	0.0727	0.1222	0.0175	0.0354	0.01825
Arkansas	0.1765	0.037	0.0737	0.1218	0.0099	0.0294	0.00519
California	3.8971	0.0333	0.088	0.1745	-0.0021	0.0246	0.0959

State (2024)	Y in tr	g	T	S	n	E	M in tr
Colorado	0.469	0.0376	0.0736	0.1215	0.0068	0.0300	0.01407
Connecticut	0.3355	0.0361	0.0939	0.155	-0.0028	0.0272	0.00913
Delaware	0.0943	0.0363	0.0764	0.122	0.0097	0.0287	0.00271
Florida	1.598	0.0417	0.0757	0.1283	0.0173	0.0325	0.0519
Georgia	0.792	0.0407	0.0758	0.1288	0.0101	0.0320	0.02534
Hawaii	0.1049	0.0335	0.0934	0.1697	-0.007	0.0249	0.00261
Idaho	0.129	0.0697	0.0736	0.1318	0.0204	0.0540	0.00697
Illinois	1.1481	0.043	0.0801	0.1001	-0.0032	0.0354	0.0406
Indiana	0.4773	0.0401	0.0723	0.1173	0.0058	0.0323	0.0154
Iowa	0.2483	0.0359	0.0765	0.1248	0.0063	0.0284	0.00705
Kansas	0.2155	0.0371	0.0766	0.1253	0.0034	0.0295	0.00636
Kentucky	0.2577	0.0391	0.0757	0.1299	0.0044	0.0309	0.00796
Louisiana	0.3046	0.0325	0.0755	0.1314	-0.0044	0.0259	0.00789
Maine	0.0863	0.0373	0.0857	0.1599	0.0071	0.0279	0.00241

State (2024)	Y in tr	g	T	S	n	E	M in tr
Maryland	0.5221	0.038	0.0833	0.1379	0.0049	0.0294	0.01535
Massachusetts	0.7416	0.035	0.0897	0.1483	-0.0029	0.0268	0.0199
Michigan	0.6839	0.0370	0.0804	0.1316	-0.001	0.0292	0.02
Minnesota	0.39	0.0828	0.1352	0.0052	0.0052	0.0303	0.0139
Mississippi	0.1503	0.0366	0.0765	0.1331	-0.0034	0.0290	0.00436
Missouri	0.4071	0.039	0.0762	0.1253	0.0032	0.031	0.0126
Montana	0.0746	0.0376	0.0751	0.1287	0.0088	0.0296	0.00221
Nebraska	0.1628	0.039	0.0768	0.129	0.0101	0.0306	0.00498
Nevada	0.2427	0.0439	0.0651	0.1195	0.0251	0.0347	0.00842
New Hampshire	0.1132	0.0376	0.0671	0.1219	0.0144	0.0299	0.00338
New Jersey	0.8781	0.0349	0.09	0.1595	-0.0022	0.0263	0.0231
New Mexico	0.1478	0.0408	0.0778	0.1489	0.0047	0.0314	0.00464
New York	2.3907	0.0394	0.0962	0.1757	-0.0036	0.0288	0.0689
North Carolina	0.7893	0.0413	0.0735	0.1293	0.0148	0.0323	0.0255
North Dakota	0.0779	0.0373	0.0745	0.1284	0.0128	0.0292	0.00227

State (2024)	Y in tr	g	T	S	n	E	M in tr
Ohio	0.8583	0.0391	0.0769	0.1282	0.0008	0.0310	0.0266
Oklahoma	0.2634	0.0411	0.074	0.1253	0.01	0.0325	0.00856
Oregon	0.3097	0.0428	0.0856	0.155	0.0024	0.0324	0.01
Pennsylvania	0.9594	0.0383	0.0782	0.1355	0.0008	0.0301	0.0289
Rhode Island	0.0785	0.0369	0.0854	0.1529	0	0.0281	0.0022
South Carolina	0.3326	0.0426	0.0736	0.1263	0.018	0.0334	0.0111
South Dakota	0.0773	0.0362	0.0711	0.1229	0.0217	0.0284	0.00219
Tennessee	0.566	0.0423	0.0724	0.1272	0.0184	0.0331	0.0187
Texas	2.6253	0.0418	0.0781	0.1371	0.0197	0.032	0.084
Utah	0.2859	0.0434	0.0752	0.1294	0.0175	0.0337	0.00964
Vermont	0.0452	0.0367	0.0907	0.1659	0	0.0273	0.00123
Virginia	0.6738	0.0366	0.0801	0.1410	0.0069	0.0282	0.0190
Washington	0.8578	0.0410	0.0816	0.1399	0.0077	0.0316	0.0271
West Virginia	0.10648	0.0492	0.0656	N/A	N/A	N/A	N/A

State (2024)	Y in tr	g	T	S	n	E	M in tr
Wisconsin	0.3544	0.0210	0.0776	0.1270	0.0051	0.0166	0.00588
Wyoming	0.0537	0.0347	0.0689	0.149	0.0172	0.0266	0.00143

When analyzed individually, these data can give an understanding that each state is in a constant growth and nothing more but, when compared to multiple years the view becomes a clear pattern.

Technical prediction

The trend of the efficiency, if analyzed during years before a crisis can show a high increase and then a sudden decrease, this spike pattern if compared with the pressure of a sector over a state economy can give hints for a specific sector crisis. It's possible to deduct from this group of parameters if a crisis is imminent and, eventually how much will impact the state based on the sector.
Taking as example the 2008 crisis for 6 different states:
The following data provides a year-by-year breakdown for California, Texas, New York, Florida, Colorado and Nevada from 2000 to 2010.

- **GDP**: Gross Domestic Product in **trillions** of current dollars (BEA).
- **Spending**: Total state government expenditures in **billions** of dollars (Census SGF).
- **Tax Income**: Total state government tax revenue in **billions** of dollars (Census STC).
- **Population**: Mid-year resident population in **millions** (Census Intercensal).

After collecting data, it is possible to apply the model of efficiency E = g × (1 - (T + S) - n) and De = Et – (Et-1).
Based on the data reported in the TABLE 1, the signs of an imminent crisis were received years before, the report suggests that a high level of efficiency has the tendency to be followed by a down peak and that, will be comparable to the importance of the economic overgrowth. 2008 showed states like Texas suffering a deeper inefficiency but, since the lower reliability on a single sector (Sp) afforded better the crisis than states like Nevada where the efficiency was showing an extreme overstretch of the state structure and not even the differentiation of the economy could reduce the impact. States like Florida and California, having a higher reliance on a single sector and coming from an over efficiency, demonstrated how this model is able to see the variable between states and still understand the outcoming. A state with a high dependance on a single sector and, a constant over efficiency, has lower opportunity to afford an economical crisis without destabilize also, when a strong peak of efficiency is followed by a drop and, the efficiency was already over the “safety” limit, the crisis alarm is triggered. During the Dot Com crisis, as showed in TABLE 2, the states that were triggered the most were California and New York, this pattern of high variation between the efficiency score and high sector pressure on the economy may lead to a crisis as shown.

Connection with previous studies

GDP growth E = **g** × (1 - (T + S) - n)

“GDP measures the total value of goods and services produced within a country.” World Bank. (2020). *World development indicators*.

A growth in the GDP is defined as a growth in the economic production of a country.

Spending relation to the growth E = g × (1 - (T + **S**) - n)

In the description of economic growth done by Robert Barro (1990) the government interest in the economy and its direct activity is part of the growth of the economy.
“Government consumption enters the production function as an input that enhances productivity.” Robert Barro (1990)
Prof. Barro allocate the government spending as investment for future improvement but, it also confirms an initial expense of the government as definition of investment, this

connects directly to the model developed since, the formula itself capture the exact year of interest, and so, by allocating the government investment into the spending area, it shows the moment before the return that will eventually be captured by the growth in the later years.

To better explain, Prof. Barro states that government spending is a future investment, the model just developed doesn't oppose the study but, states that government spending, even if is a long-term increase in productivity, is a short-term pressure on the economy.

Barro, R. J. (1990). *Government spending in a simple model of endogenous growth*. Journal of Political Economy, 98(5), S103–S125.

Armey Curve also connects the government spending to the economy growth by defining a "perfect ratio" where the government spending has the maximum efficiency toward the economic growth of a country, considering the integration of government spending in the formula, the result aligns with the Armey curve theory by localizing an exact position in relation to other factors. Armey, R. (1995). *The freedom revolution*. Washington, DC: Regnery Publishing.

Taxation relation to the growth $E = g \times (1 - (T + S) - n)$

From the 1990 Barro's publication "A higher income tax rate reduces the private return to capital and, therefore, the incentive to invest", This quote states a direct connection between the interest of the private and the necessity of the government, even if the taxation is the primary necessity of a state in order to cover the spending, the taxation is a form of pressure over the economy growth.

The relation between the spending and the taxation to the growth of the economy can be so reassumed in the definition: "Even if necessary and/or used as investment, the taxation and spending can be considered short term pressure over the economy growth".

Barro, R. J. (1990). *Government spending in a simple model of endogenous growth*. Journal of Political Economy, 98(5), S111.

Population growth $E = g \times (1 - (T + S) - n)$

Population growth is identified by the IMF in *The fiscal consequences of shrinking populations* (Staff Discussion Note SDN/15/21) “Demographic trends can have profound effects on public finances through their impact on both government spending and revenue.”

The model represents a short-term view effect on this specific matter, a rapid population growth can place immediate pressure on public services, while fiscal systems may adjust more gradually.

International Monetary Fund. (2015). *The fiscal consequences of shrinking populations* (Staff Discussion Note SDN/15/21).

Economy Balance E = 0

From Richard Armey (1995) “There is a level of government spending that maximizes economic growth.”, in this quote, Armey sustain that, the contribution of the government spending is a factor of economic growth, confirmed by the model but, the consideration of equilibrium is given, in the model, by calculating how big is the pressure over the growth in the short term. Armey, R. (1995). *The freedom revolution*. Washington, DC: Regnery Publishing.

“The relationship between government size and economic growth is widely considered non-linear, with an optimal level of public expenditure that maximizes economic performance” Vedder & Gallaway, 1998. This study confirms the possibility of an equilibrium point and put the foundation to the model.

In consideration to the Vedder & Gallaway study, the model identifies the equilibrium point in the middle between the over pressure g **<** (1 - (T + S) - n) and the overproduction g **>** (1 - (T + S) - n). Vedder, R. K., & Gallaway, L. E. (1998). *Government size and economic growth*. Washington, DC: Joint Economic Committee.

Model applied

The role of structural imbalances and volatility are considered often key contributors to economic crises by many sources.

Macroeconomic imbalances increase systemic vulnerability (International Monetary Fund, 2014), this note explains why an extreme point isn’t ideal, of course there should be still preference (0+) since the higher problems during a recession.

Periods of high volatility are frequently associated with downturns (OECD, 2016).
Applied to the model, confirms the empirically work done as demonstration.

Furthermore, structural weaknesses can amplify the impact of shocks (World Bank, 2019). A higher instability given by the over relation on a single sector is also

showed in the model as determinant factor for the identification of risk and impact size of an economy.

Following these citations, the model doesn't just respect the rules of modern macroeconomy but, contributes to integrating these perspectives into a unified analytical framework.

International Monetary Fund. (2014). *Annual report 2014: From stabilization to sustainable growth*.

Organization for Economic Co-operation and Development. (2016). *OECD economic outlook* (Vol. 2016, Issue 1). OECD Publishing.

World Bank. (2019). *Global economic prospects: Heightened tensions, subdued investment*. World Bank Group.

Limitations of the Model

While the Cipriani Economic Model provides a structured framework for evaluating fiscal-adjusted economic efficiency, several limitations must be acknowledged.

- The model does not establish causal relationships between its variables. The relationships between GDP growth, taxation, government spending, and population dynamics are complex so, the model should be interpreted as a descriptive and comparative tool, rather than a definitive predictor of economic outcomes.
- The model treats government spending (S) as a short-term fiscal cost within the year of analysis. Therefore, S should be interpreted as a current-period fiscal burden, not as a judgment on the long-term value of government spending.
- The interpretation of population growth (n) as a short-term fiscal pressure is a simplification. While rapid population increases may strain public resources in the short run, population dynamics can also contribute positively to economic growth

through labor force expansion, innovation, and consumption. The model captures only the short-term fiscal dimension of this variable.

- The model relies on aggregate macroeconomic data, which may obscure important structural differences within states or countries. Regional disparities, sectoral dynamics, and institutional factors are not explicitly incorporated, except indirectly through the sector pressure indicator (Sp).
- The identification of equilibrium conditions ($E \approx 0^+$) represents a theoretical interpretation specific to this framework. This threshold is not derived from universally established economic laws and may vary depending on institutional context, economic structure, and time horizon.
- While the model suggests that patterns in De may be associated with periods of instability, these observations are empirical correlations rather than statistically validated predictive relationships. A more rigorous validation would require panel data analysis, econometric testing, and out-of-sample forecasting.

Finally, the accuracy of the model depends on the quality and consistency of the underlying data. Differences in reporting standards, timing, and measurement across data sources may introduce distortions in the calculated values of E and M.

For these reasons, the model should be understood as an analytical framework for interpretation and comparison, rather than a standalone predictive or policy-prescriptive tool. Further empirical testing and methodological refinement are necessary to assess its robustness and broader applicability.

State	Year	E	De	Sp
California	2001	0.0337	NA	0.2416
California	2002	0.0248	-0.0089	0.2364
California	2003	0.0458	0.021	0.2359
California	2004	0.0675	0.0217	0.2353
California	2005	0.0553	-0.0122	0.2386
California	2006	0.059	0.0037	0.2382
California	2007	0.0351	-0.0239	0.2338
California	2008	-0.0208	-0.0559	0.2277
California	2009	-0.0269	-0.0061	0.2277
California	2010	0.0247	0.0516	0.2269
Texas	2001	0.0358	NA	0.149
Texas	2002	0.0253	-0.0105	0.1509
Texas	2003	0.0489	0.0236	0.1534
Texas	2004	0.0759	0.027	0.1494
Texas	2005	0.0764	0.0005	0.149
Texas	2006	0.0875	0.0111	0.1496
Texas	2007	0.0654	-0.0221	0.1505
Texas	2008	0.0357	-0.0297	0.1523
Texas	2009	-0.0545	-0.0902	0.1544
Texas	2010	0.0637	0.1182	0.1503
New York	2001	0.0203	NA	0.3329
New York	2002	0.023	0.0027	0.3235
New York	2003	0.0427	0.0197	0.3285
New York	2004	0.0669	0.0242	0.3333
New York	2005	0.0555	-0.0114	0.3333
New York	2006	0.0536	-0.0019	0.3409
New York	2007	0.0451	-0.0085	0.3452
New York	2008	0.0121	-0.033	0.3421
New York	2009	-0.0213	-0.0334	0.3505
New York	2010	0.0388	0.0601	0.3496
Florida	2001	0.0472	NA	0.2246
Florida	2002	0.0493	0.0021	0.2323
Florida	2003	0.0732	0.0239	0.2362
Florida	2004	0.095	0.0218	0.2387
Florida	2005	0.0814	-0.0136	0.25
Florida	2006	0.0628	-0.0186	0.2506
Florida	2007	0.026	-0.0368	0.245
Florida	2008	-0.0202	-0.0462	0.2365
Florida	2009	-0.0523	-0.0321	0.2349
Florida	2010	0.011	0.0633	0.2331
Colorado	2001	0.0316	NA	0.1934
Colorado	2002	0.0248	-0.0068	0.1925

Colorado	2003	0.0457	0.0209	0.1919
Colorado	2004	0.0723	0.0266	0.1907
Colorado	2005	0.0649	-0.0074	0.1948
Colorado	2006	0.0518	-0.0131	0.1959
Colorado	2007	0.0447	-0.0071	0.1899
Colorado	2008	0.0157	-0.029	0.1818
Colorado	2009	-0.0415	-0.0572	0.1825
Colorado	2010	0.029	0.0705	0.1808
Nevada	2001	0.0605	NA	0.1975
Nevada	2002	0.0703	0.0098	0.1932
Nevada	2003	0.0888	0.0185	0.1939
Nevada	2004	0.1185	0.0297	0.1947
Nevada	2005	0.0937	-0.0248	0.192
Nevada	2006	0.0705	-0.0232	0.194
Nevada	2007	0.0208	-0.0497	0.1898
Nevada	2008	-0.0223	-0.0431	0.1791
Nevada	2009	-0.0642	-0.0419	0.1694
Nevada	2010	0.0265	0.0907	0.1719

State	Year	E	De	Sp
California	1996	0.0449		0.2305
California	1997	0.0565	0.0116	0.2319
California	1998	0.0532	-0.0033	0.2354
California	1999	0.0718	0.0186	0.2385
California	2000	0.0625	-0.0093	0.2376
Texas	1996	0.0688		0.1409
Texas	1997	0.0615	-0.0073	0.1424
Texas	1998	0.0507	-0.0108	0.1433
Texas	1999	0.048	-0.0027	0.1445
Texas	2000	0.0635	0.0155	0.1456
New York	1996	0.0499		0.3272
New York	1997	0.0598	0.0099	0.3314
New York	1998	0.0511	-0.0087	0.3356
New York	1999	0.0643	0.0132	0.3371
New York	2000	0.0558	-0.0086	0.3329
Florida	1996	0.06		0.2222
Florida	1997	0.0607	0.0007	0.2228
Florida	1998	0.0585	-0.0022	0.2251
Florida	1999	0.057	-0.0015	0.2239
Florida	2000	0.0609	0.0039	0.2211
Colorado	1996	0.086		0.1885
Colorado	1997	0.0832	-0.0028	0.194
Colorado	1998	0.0814	-0.0018	0.1973
Colorado	1999	0.074	-0.0074	0.1938
Colorado	2000	0.0738	-0.0002	0.1897
Nevada	1996	0.0932		0.1852
Nevada	1997	0.0834	-0.0098	0.1864
Nevada	1998	0.0753	-0.0081	0.1875
Nevada	1999	0.0831	0.0078	0.2
Nevada	2000	0.0771	-0.006	0.1974