Money Matters: Broad Divisia Money and the Recovery of Nominal GDP from the COVID-19 Recession*

Michael D. Bordo
Rutgers University, NBER, and Hoover Institution
John V. Duca
Oberlin College and
Federal Reserve Bank of Dallas

*The views expressed are those of the authors and are not necessarily those of the Federal Reserve Bank of Dallas or of the Federal Reserve System. We thank Robert Hetzel, Cristina Manea, Alex Schibuola, Tara M. Sinclair, David VanHoose, and participants at the 2023 Oxford Saiz – ETH Zurich Macro-Finance Conference and 2023 Swiss National Bank Research Conference for comments and suggestions, and Jonah Danziger and Claire Jeffress for excellent research assistance.

Introduction

Strong (>4%) US nominal GDP growth in 2021-22 coincided with inflation rising above 2% => role for demand, not just supply.

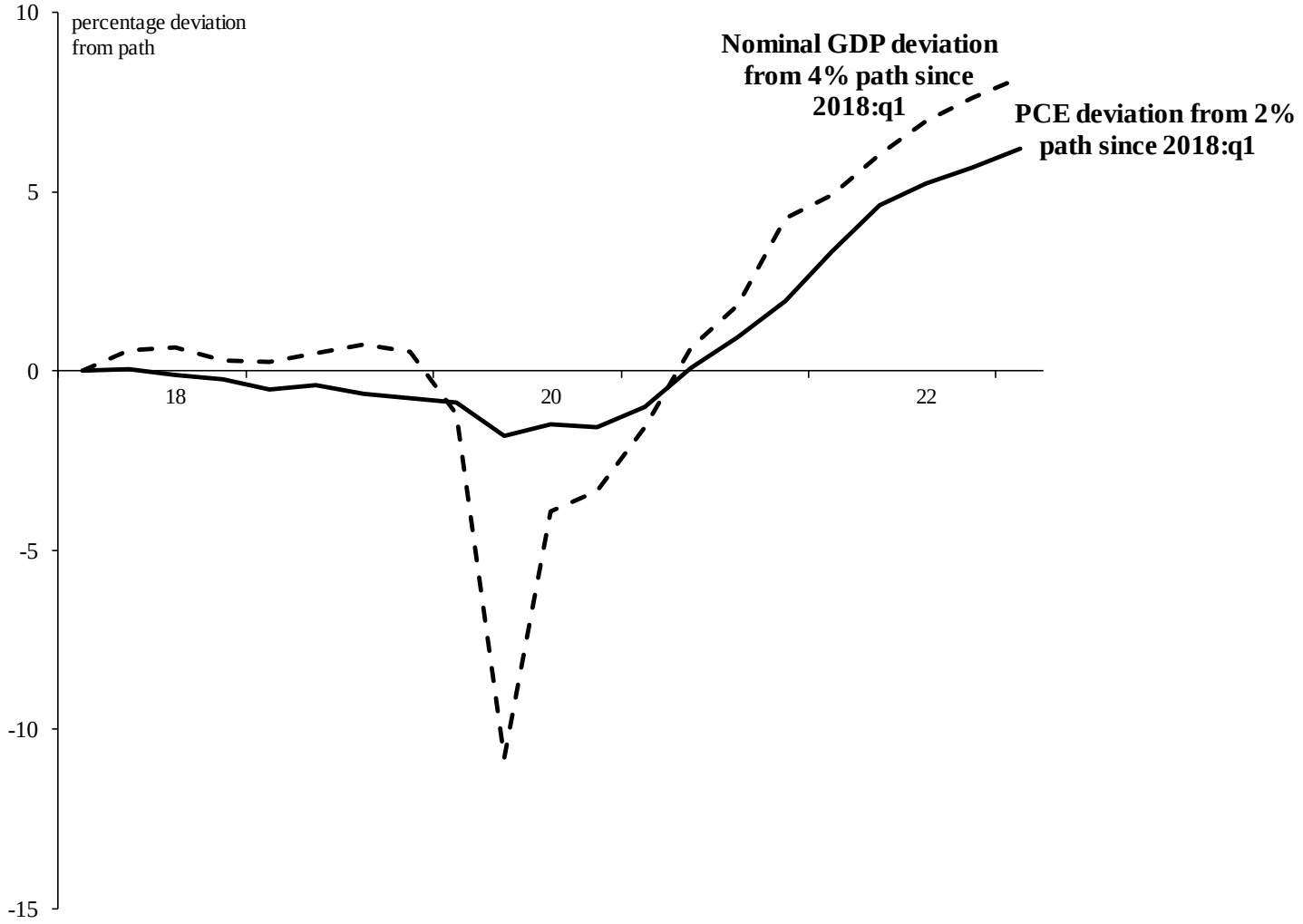
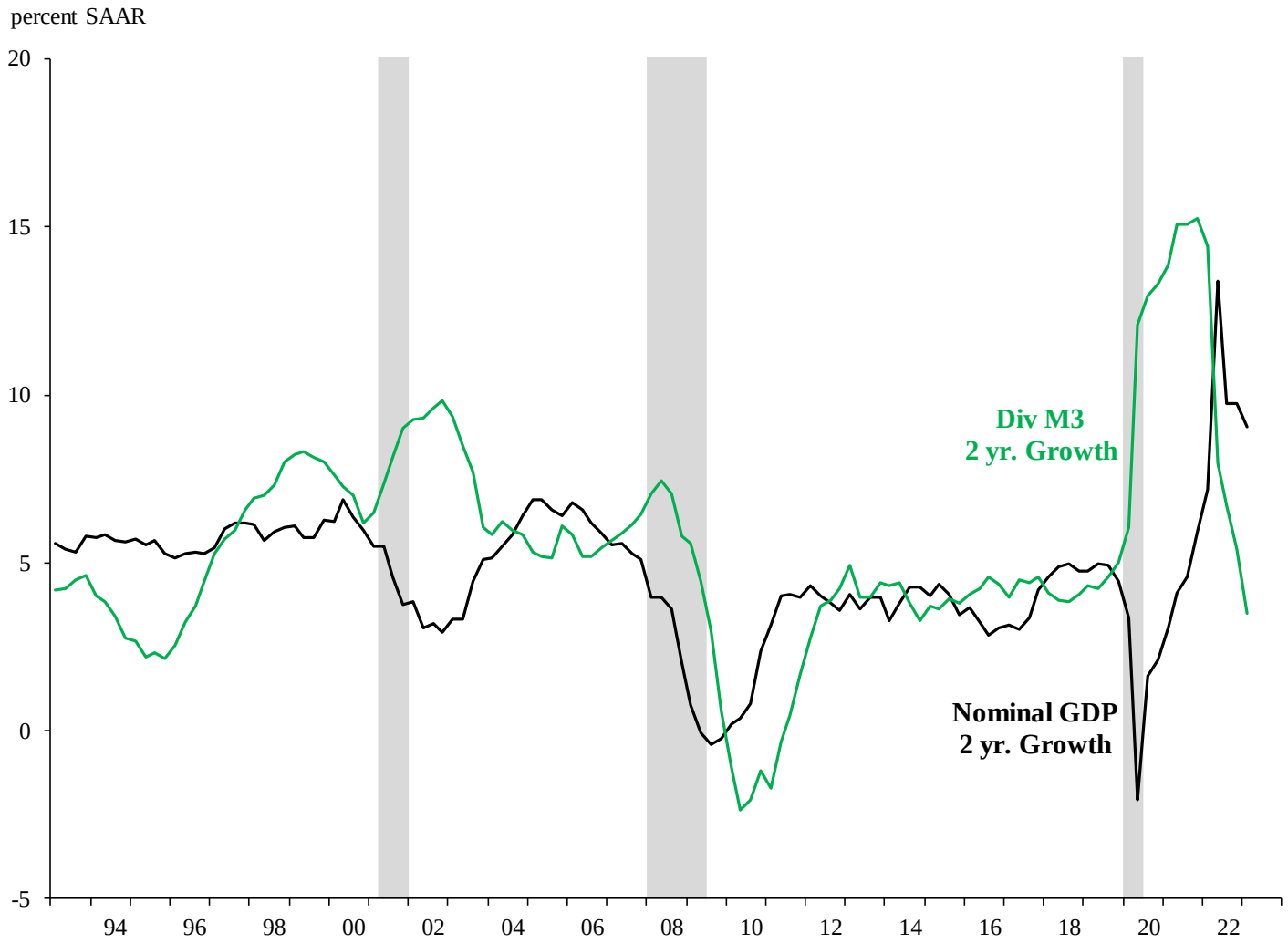


Figure 2: Above 4 % Nominal GDP Growth Linked to Above 2% Inflation
(Deviations from Hypothetical Target Paths Sources: BEA and authors' calculations)

Introduction

Strong (>4%) US nominal GDP growth in 2021-22 coincided with inflation rising above 2% => role for demand, not just supply.

Traditional Chicago view: MV = PY, if V stable in long-run, too much M growth will eventually fuel high inflation.



Broad Divisia Money and Nominal GDP Growth

(Sources: Center for Financial Stability, Federal Reserve, and authors' calculations.)

Introduction

Strong (>4%) US nominal GDP growth in 2021-22 coincided with inflation rising above 2% => role for demand, not just supply.

Traditional Chicago view: MV = PY, if V stable in long-run, too much M growth will eventually fuel high inflation.

Instability in demand for simple-sum money aggregates made them unreliable, why inflation surprised many after rapid money growth.

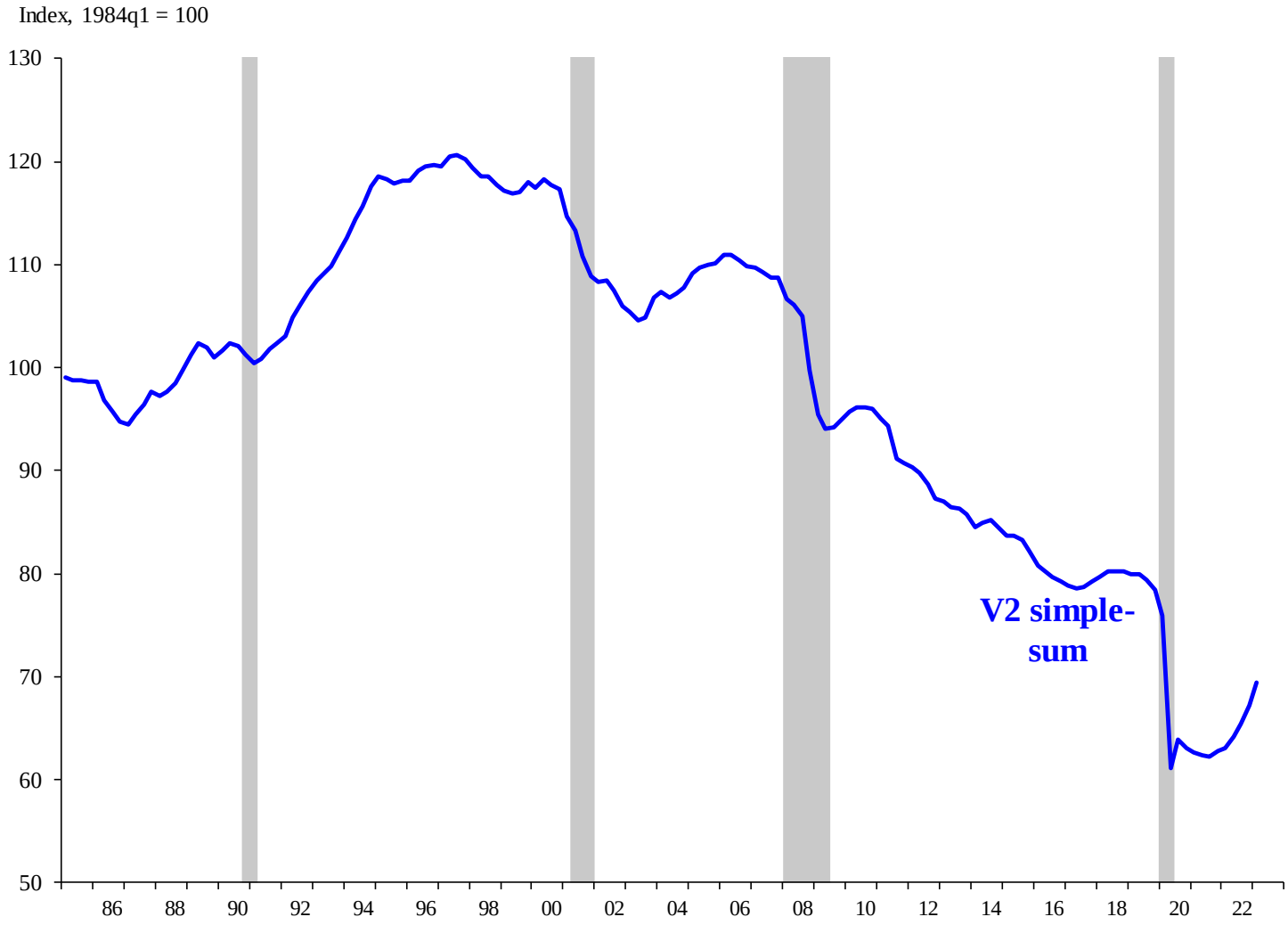


Figure 5: Since early 1990s, the Velocity of Simple-Sum M2 Very Unstable
(Sources: CFS, Federal Reserve, and authors' calculations. Shaded areas are NBER recessions.)

Introduction

Strong (>4%) US nominal GDP growth in 2021-22 coincided with inflation rising above 2% => role for demand, not just supply.

Traditional Chicago view: MV = PY, if V stable in long-run, too much M growth will eventually fuel high inflation.

Instability in demand for simple-sum money aggregates made them unreliable, why inflation surprised many after rapid money growth.

Papers by Barnett & coauthors: Divisia M better than simple-sum M's. Our contribution: we improve short- and long-run models of demand for Div M3, which exhibits reasonable long-run stability.

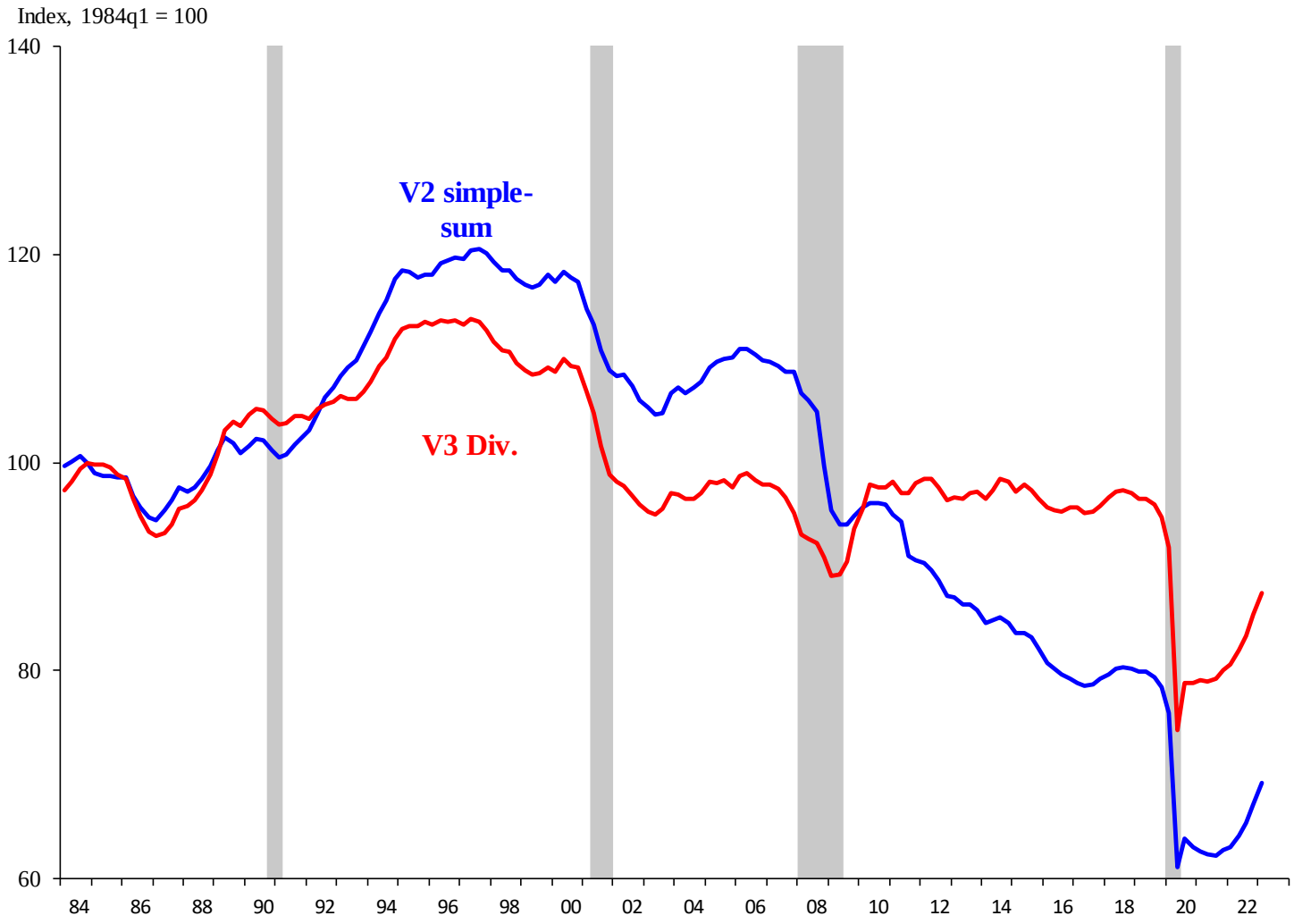


Figure 5: Since the mid-1980s, the Velocity of Broader Divisia Money (M3) Is More Stable than that of Simple-Sum M2

(Sources: CFS, Federal Reserve, and authors' calculations. Shaded areas are NBER recessions.)

Introduction

Strong (>4%) US nominal GDP growth in 2021-22 coincided with inflation rising above 2% => role for demand, not just supply.

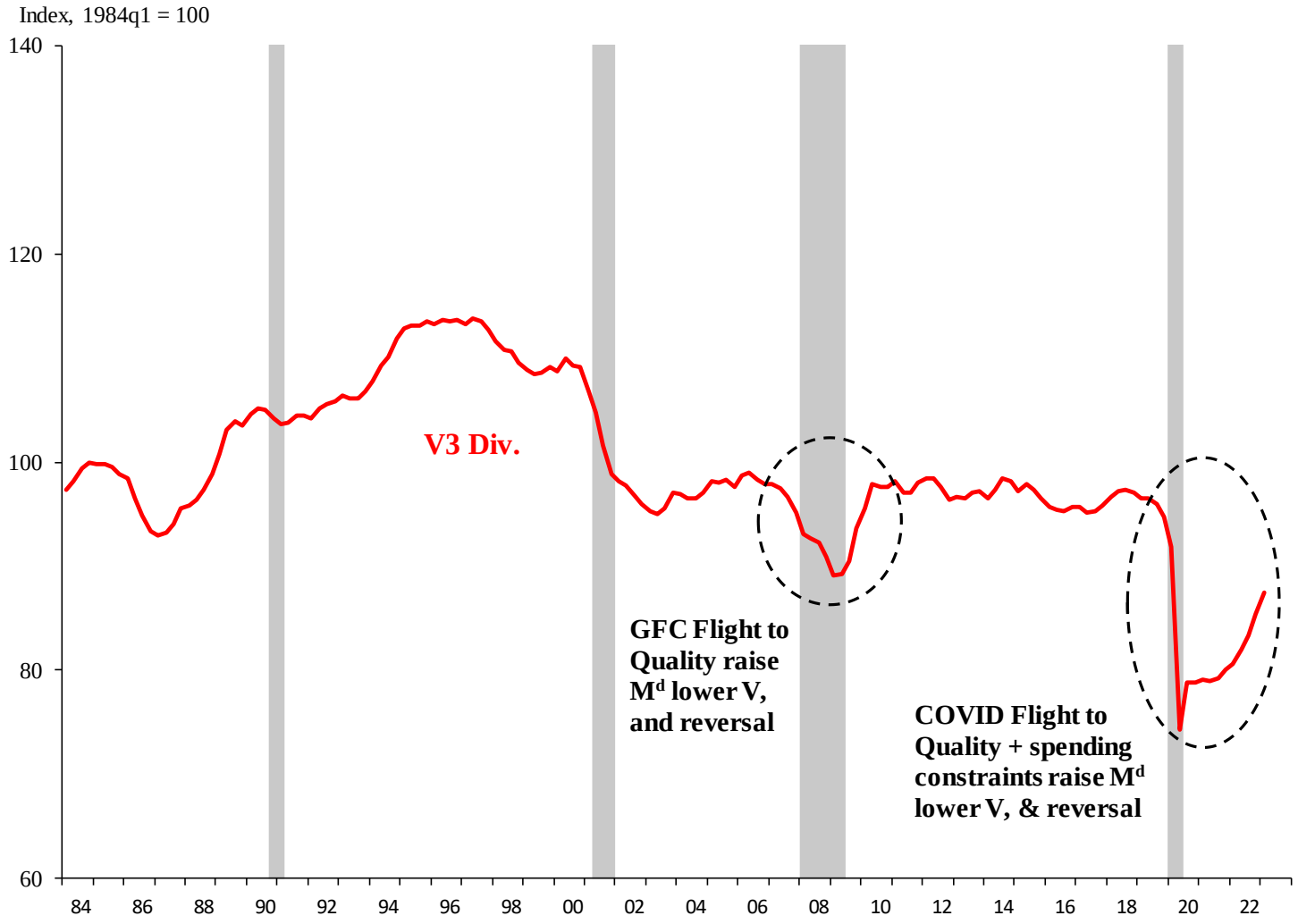
Traditional Chicago view: MV = PY, if V stable in long-run, too much M growth will eventually fuel high inflation.

Instability in demand for simple-sum money aggregates made them unreliable, why inflation surprised many after rapid money growth.

Papers by Barnett & coauthors: Divisia M better than simple-sum M's. Our contribution: we improve short- and long-run models of demand for Div M3, which exhibits reasonable long-run stability.

Velocity (V3 = GDP/M3) fell in GFC as uncertainty raised M^D, then recovered; V3 fell in pandemic, now recovering.

Flights to Quality and the Pandemic Affect M^d and Hence V in the Short and Medium Runs, Respectively



Introduction

Strong (>4%) US nominal GDP growth in 2021-22 coincided with inflation rising above 2% => role for demand, not just supply.

Traditional Chicago view: MV = PY, if V stable in long-run, too much M growth will eventually fuel high inflation.

Instability in demand for simple-sum money aggregates made them unreliable, why inflation surprised many after rapid money growth.

Papers by Barnett & coauthors: Divisia M better than simple-sum M's. Our contribution: we improve short- and long-run models of demand for Div M3, which exhibits reasonable long-run stability.

Velocity (V3 = GDP/M3) fell in GFC as uncertainty raised M^D, then recovered; V3 fell in pandemic, now recovering.

Fed's anti-inflation policy slowed Div M3 growth from rapid to slightly negative. Recovery of V explains delayed slowing of nom GDP growth. Reflects monetary policy has long & variable lags.

Accounting for movements in V, Div M3 helpful *as an information variable* for forecasting nominal GDP (extends Serletis, 2012)

Roadmap for the Rest of the Presentation

- Overview of the Divisia approach to measuring M
- Interpreting our study from an IS-MP perspective
- Results for modeling velocity
- COVID scenarios for the recovery of velocity
- Implications for nominal GDP going forward
- Concluding comments

Overview of Divisia Monetary Aggregates (indexes)

- Divisia treats the price of monetary services as the differential between the interest rates on a risk-free asset not providing monetary services and on a monetary asset providing services. One pays for M services by giving up this interest differential.
- As with any price, Divisia assumes that the marginal utilities of services provided are proportional to their user cost prices.
- The growth rate of a Divisia index = weighted avg of growth rates of components with weights = avg expenditure shares, where expenditure on each component = user cost x holdings. Simple sum M growth rates apply deposit shares as weights
- Thus, growth in higher interest bearing M components gets less weight in calculating the growth rate of Divisia indexes, than in calculating the growth rate of simple-sum M's.

Overview of Divisia Monetary Aggregates (indexes)

- We focus on CFS Divisia M3, drawing from measurement by Anderson and Jones (FRBSTL)
  - DivM2 liquidity services from M2 balances
  - DivM3 adds services from large time deposits, repos, & institutional MMMFs
  - Internalizes shadow bank money
  - Also DivM4- and DivM4+ that add Com. Paper & Treas.
- Broad Divisia V falls in crises, but later recovers. Since aggregate demand = M x V, this imparts long and variable lags in the effects of swings associated with money growth.

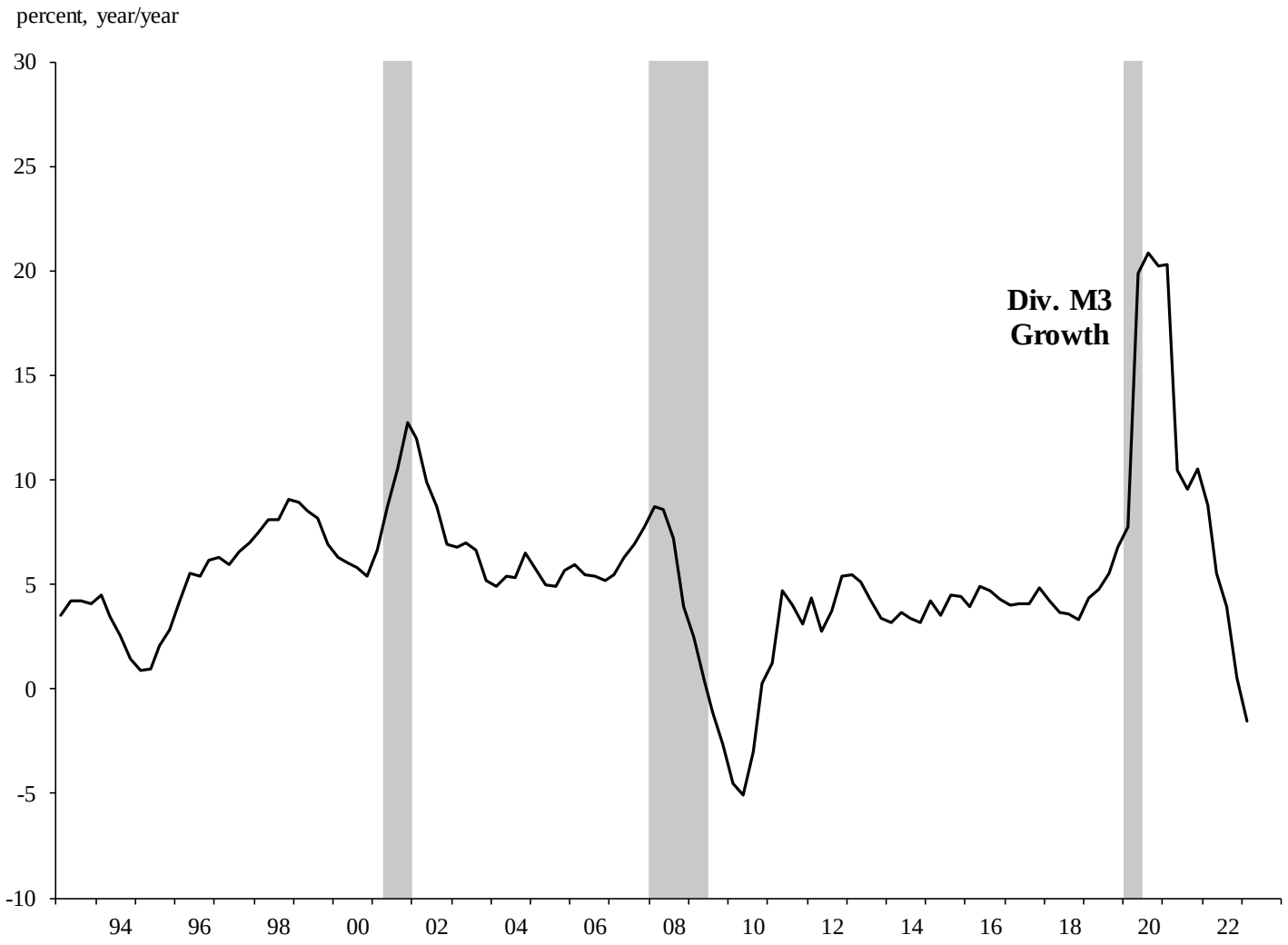
Interpreting our Study from an IS-MP Perspective

When Fed pegs interest rates, money will grow faster if the IS curve shifts right

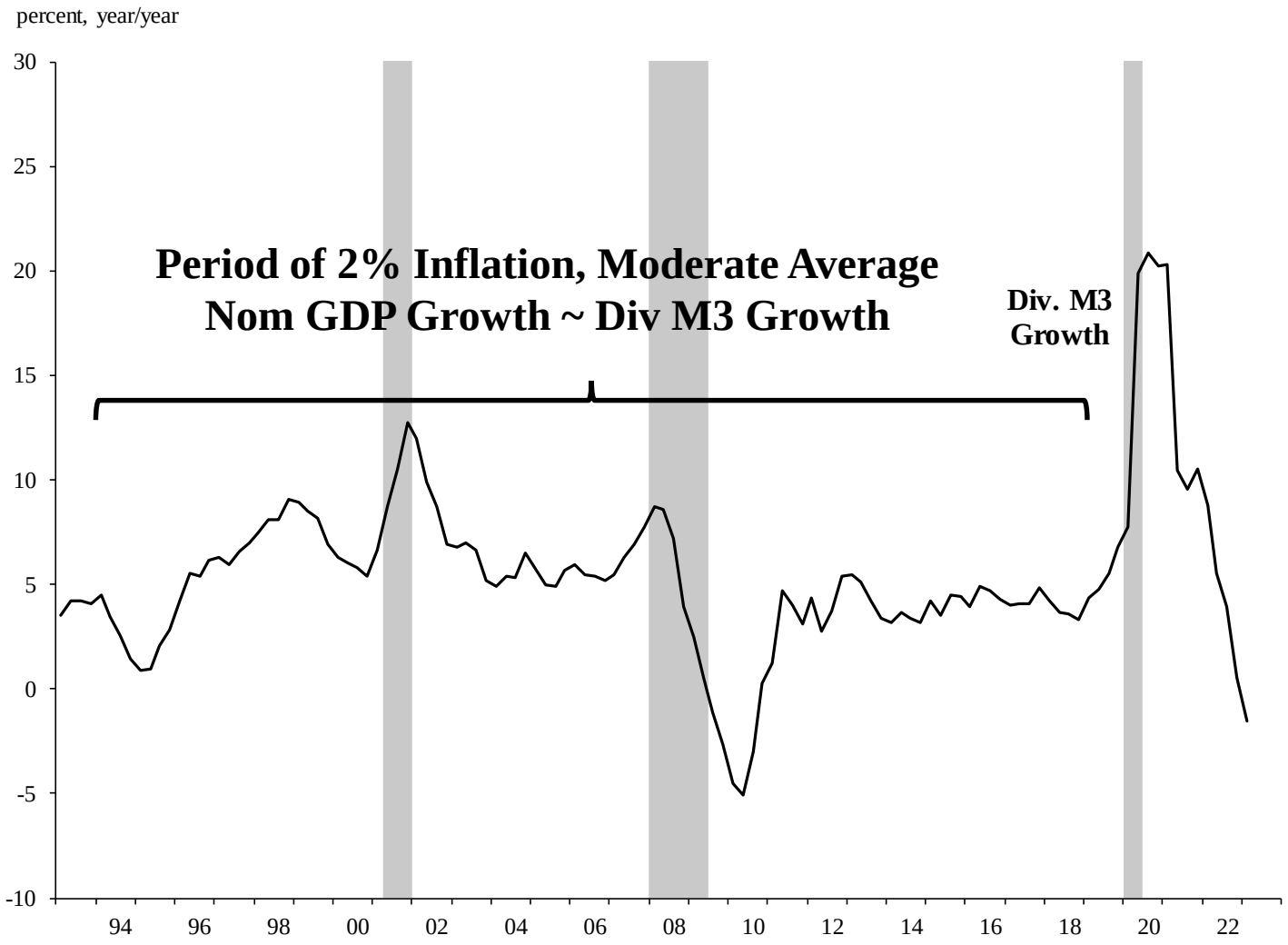
Credit frictions from loan losses, uncertainty, and tougher bank regulation restrained aggregate demand in the Great Recession and its recovery. Div. M3 growth was very weak from weak credit & money creation.

Credit frictions were much less in the pandemic era. Loan losses and uncertainty limited by stronger regulation, Fed support for corporate bond finance, and fiscal support to firms (PPP loans) and households. As a result, reserve injections from QE were able to greatly boost money & credit creation.

If model velocity (V) well, can use Div. M3 growth as an information variable.



Broad Divisia Money Much Weaker During the Subprime Bust Vs Pandemic
(Sources: Center for Financial Stability, Federal Reserve, and authors' calculations.)



Broad Divisia Money Much Weaker During the Subprime Bust Vs Pandemic
(Sources: Center for Financial Stability, Federal Reserve, and authors' calculations.)

Model Divisia M3 Velocity, Then Covid Scenarios for Velocity & Implications for Nominal GDP

Velocity of Div M affected by new assets and financial engineering that alters the relative liquidity of illiquid assets vs. liquid Div M assets.

Broad Div M demand affected by changing liquidity of nonmoney stock assets associated with regulation and falling mutual fund transfer costs.

Div M demand rises (V falls) if mutual fund transfer costs rise or if new laws make stocks more risky (CFMA derivative rules).

Also, V fell during COVID restrictions that prevented spending, eased by vaccinations. Track Covid effects by *StringVax* = Oxford Govt Restrictions index x (1 – share fully vaccinated).

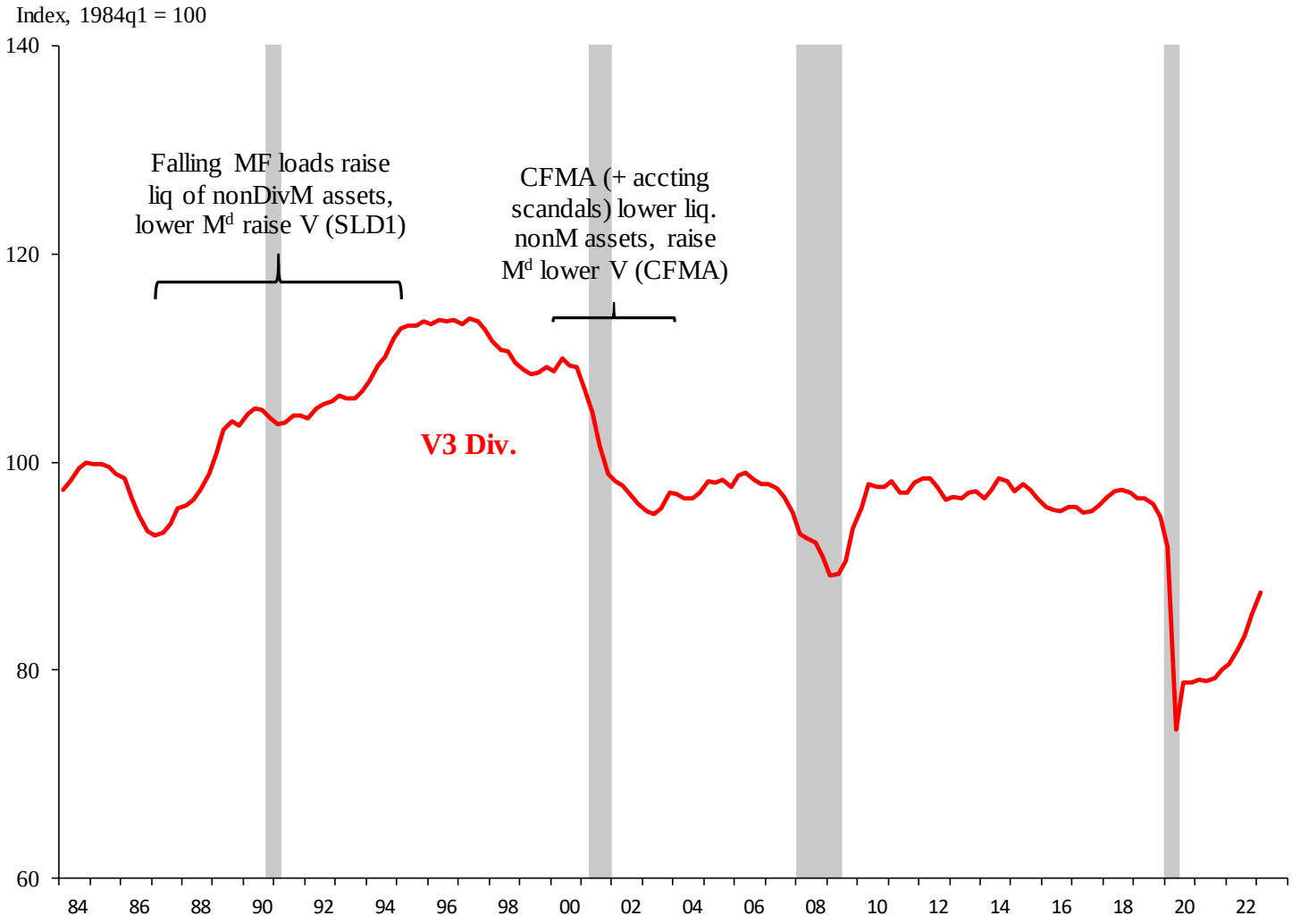
$$\ln VDivM^*_t = \alpha_0 + \underbrace{\alpha_1 \ln MFLoads_t}_{(-)} + \underbrace{\alpha_2 CFMA_t}_{(-)} + \underbrace{\alpha_3 StringVax_t}_{(-)}$$

changing liquidity non Div M assets

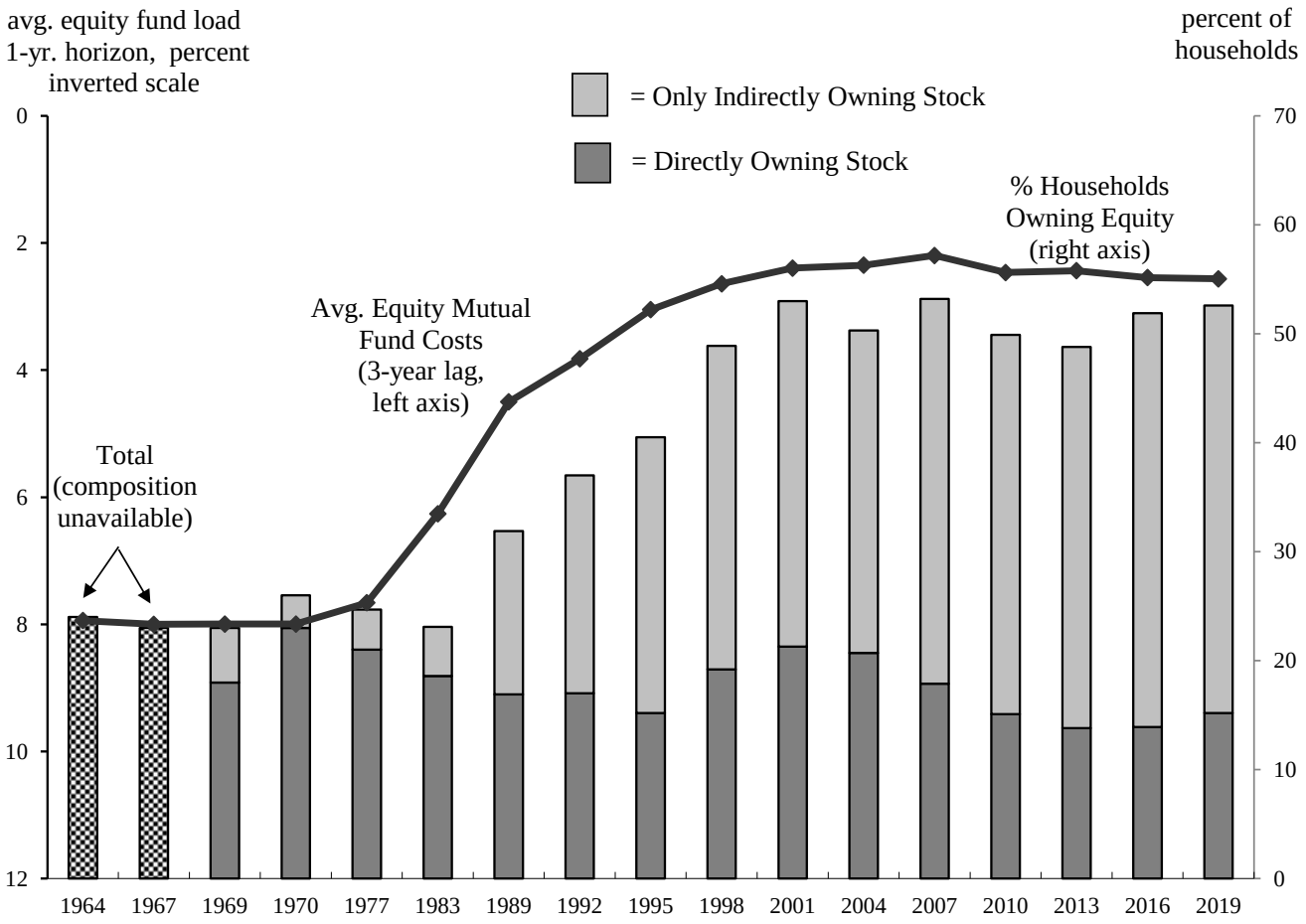
Regs changing risk of non-money financial assets

Pandemic Effects

Technological and Regulatory Factors Affecting the Liquidity of Non-M Assets Affect M^d and hence V



Inverted Stock Mutual Fund Costs Very Correlated with Stock Ownership Rates (Duca&Walker, '22)

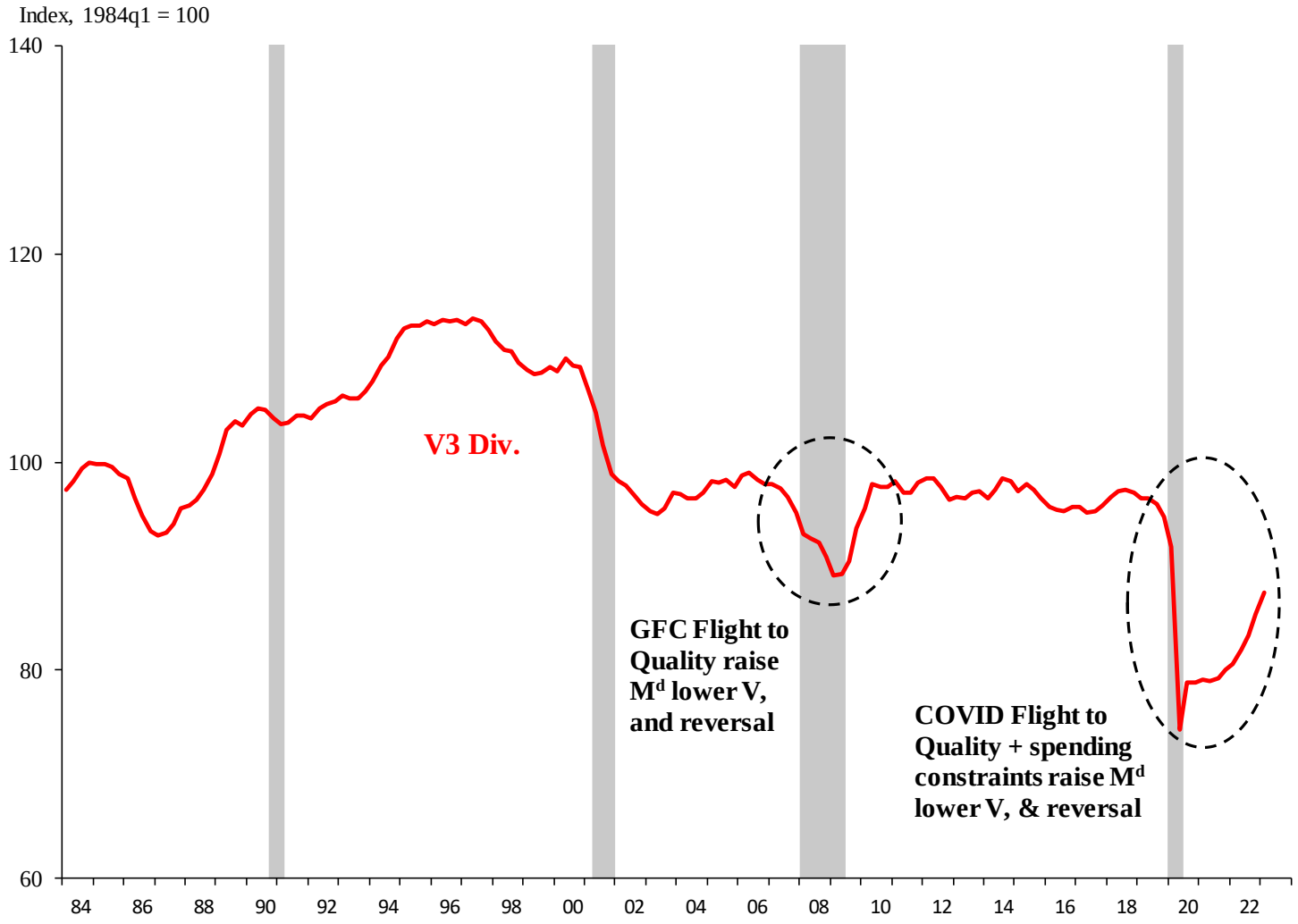


Sources: Various Surveys of Consumer Finances reported in *Federal Reserve Bulletin* articles and authors' calculations.

Divisia M and Derivatives

- Commodity Futures Modernization Act (CFMA) made derivatives legally enforceable, gave derivatives bankruptcy priority over most debt (Bolton & Oehmke, 2015, *JF*). Increase risk of nonDiv M assets, raise demand for DivM, lower V. Level shift variable *CFMA* = 1 since early 2001.

Flights to Quality and the Pandemic Affect M^d and Hence V in the Short and Medium Runs, Respectively



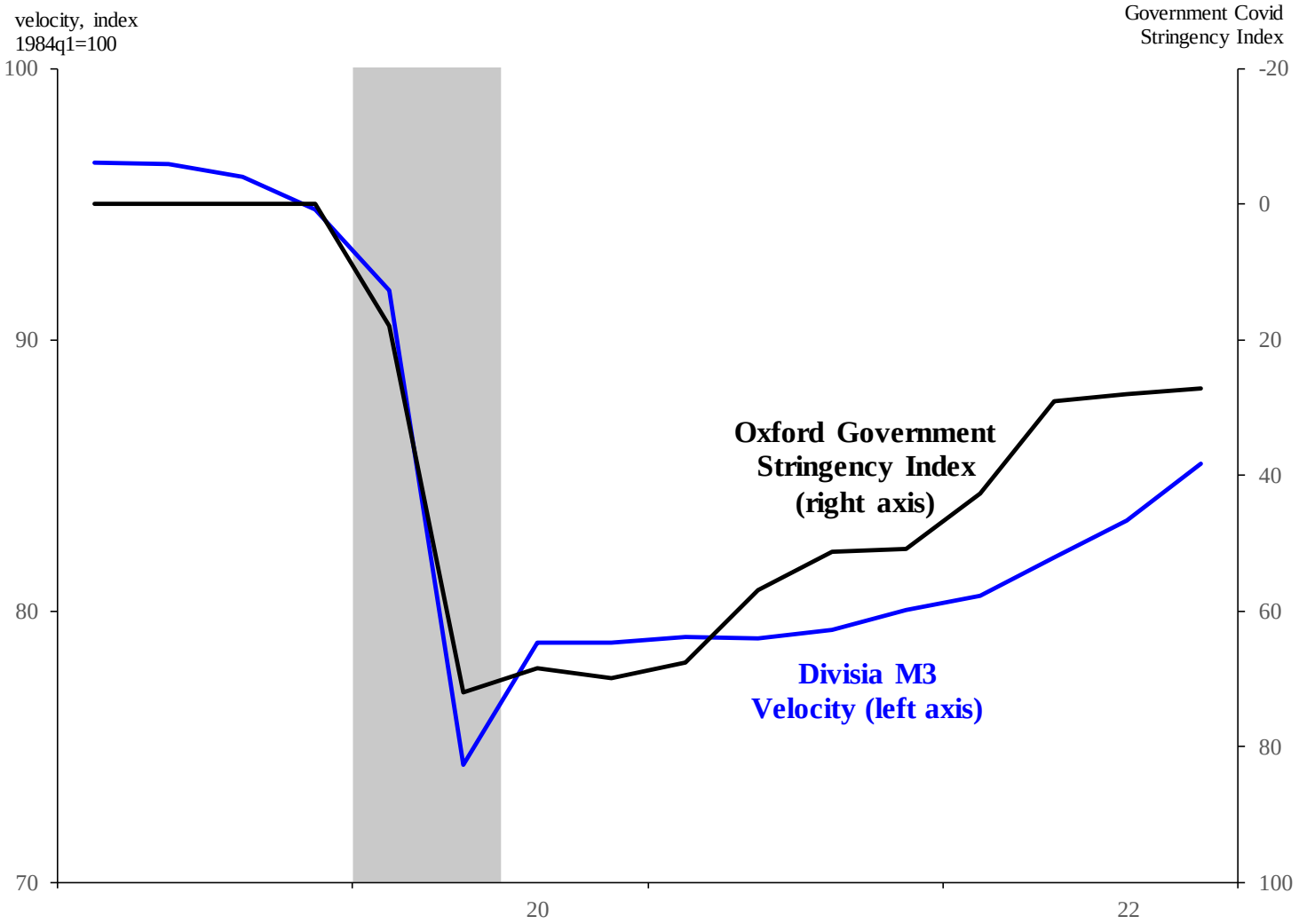


Figure 10: Velocity Affected by Government Restrictions in the COVID-19 Pandemic

(Sources: BEA, Federal Reserve, CFS, Oxford's Blavatnik Center, and authors' calculations)

Long- and Short-Run Specifications

Long-Run (natural log (ln) levels)

$$\ln VDivM3^{*}_{t} = \alpha_0 + \alpha_1 \ln MFLoads_t + \alpha_2 CFMA_t + \alpha_3 StringVax_{t+1}$$
$$\qquad\qquad\qquad\qquad\qquad\quad (-) \qquad\quad (-) \qquad\quad (-)$$

Short-Run (first difference, ln)

$\Delta \ln VDivM3_t = \beta_0 + \beta_1 EC_{t-1} + \beta_i$ changes in l-run variables

+ s-run effects (e.g., flight-to-quality)

+ extra s-run Covid effects

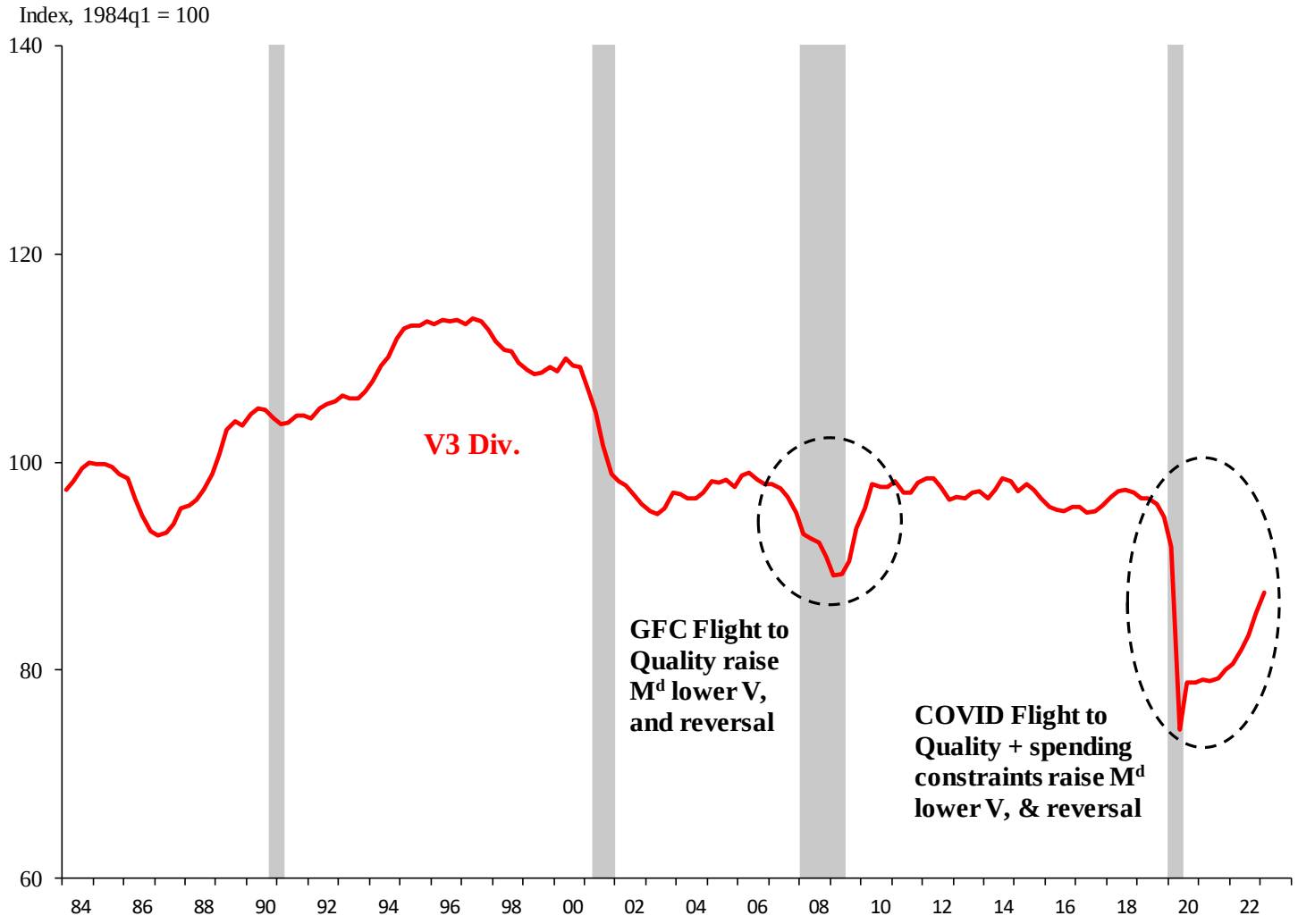
$EC_{t-1} = \ln VDivM3_{t-1} - \ln VDivM3^{*}_{t-1}$

expect $\beta_1 < 0$ so that changes in V move the level of V toward its equilibrium

Estimate with cointegration methods ala Johansen (1998)

Samples 1986q1 – 2019q4 and 1986q1-2023q1 using data from the era of deregulated deposits since mid-1984.

Flights to Quality and the Pandemic Affect M^d and Hence V in the Short and Medium Runs, Respectively



Key Money Demand Results

Key Money Demand Results

Unique & significant long-run relationships pre- & post-Covid

Long run coefficients significant with the expected signs: velocity is decreasing in MF loads, *CFMA* and *StringVax*.

4 to 5 quarter lead of the estimated equilibrium lines up with V.

Short-run models perform well. Changes in V move its level toward long-run equilibrium at a sensible speed, 12%/qtr. Short-run control coefficients are sensible and significant. Reasonable model fits and clean residuals. Of Div M's, models perform best for Div M3.

Velocity Scenarios

Convert models into ARDL equivalents, which are easier to use to construct forecasts of velocity. We use fast, medium, and slow scenarios in which the s-run and l-run recoveries of velocity depend on paths for the waning of restrictions and Covid risk aversion.

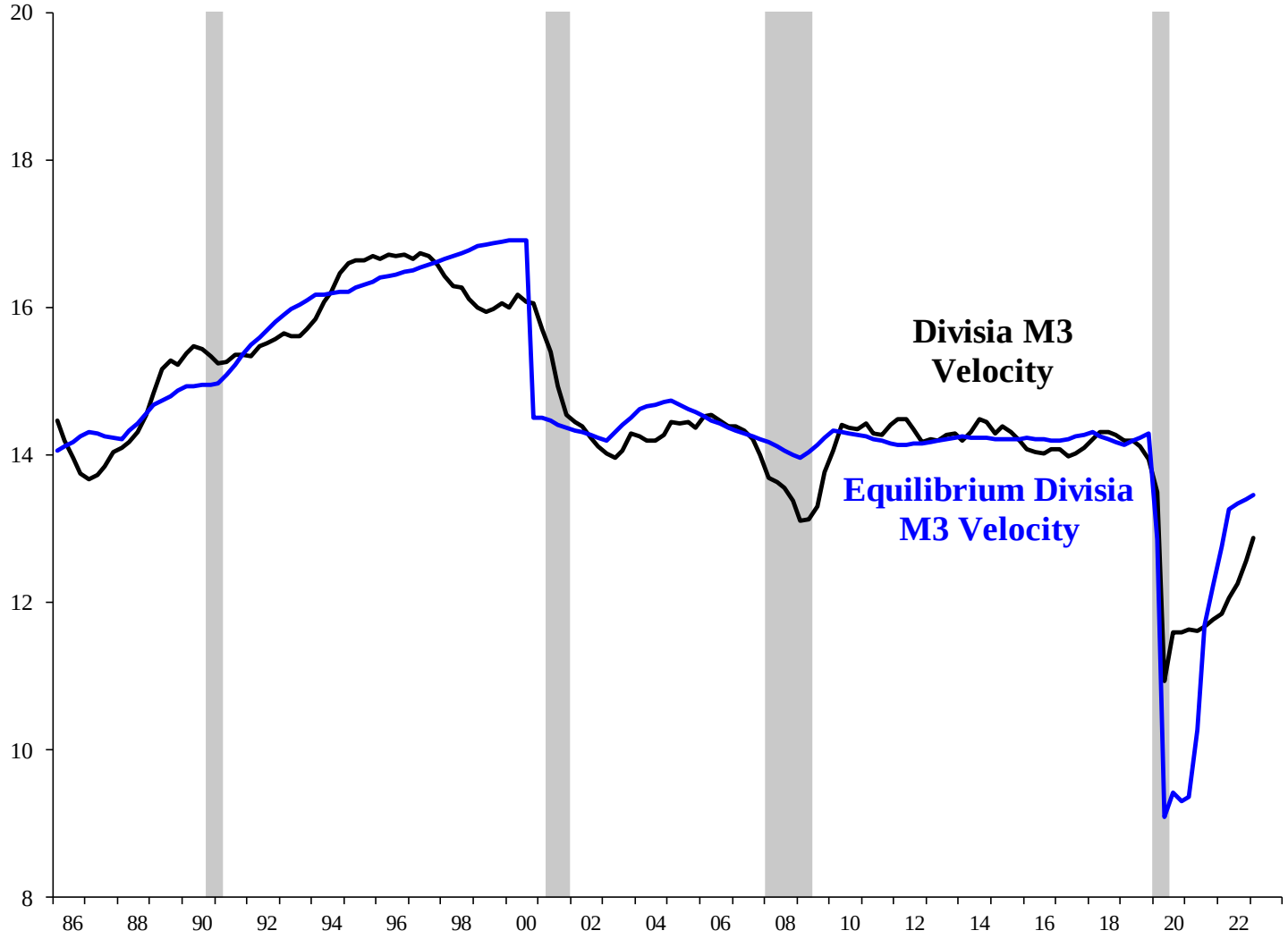


Figure 11: Covid-Adjusted Equilibrium Tracks Trends in Actual M3 Divisia Velocity

(Sources: BEA, CFS, and Authors' calculations. Shaded areas denote NBER recessions.)

Velocity Sensitive to COVID Effects: COVID Recovery Scenarios

- Gov't stringency peaked at 72 (2020q2) above its pre-pandemic level, receded to 42 in 2022q2, 27 by 2023q1
- Vaccinations plateau near 69% in 2023q1 and 2023q2
- Forecasts: vaccination rate ticks up in late 2023, then levels out
- All other l-run & short-run variables frozen at 2023q1 levels
- Use ARDL model equivalents to coint. models, ease of forecasting
- Differ by how much COVID gov't stringency unwinds. 3 paths:
  - Low: stringency falls from 27 '23q1 to 22 '23q2, flat thereafter
  - Medium: falls 5 pts/quarter until 2023q3, stays at 17 thereafter
  - Optimistic: falls 5 pts/quarter until reaching 0 in 2024q2, 0 thereafter
- S-run effects => a little overshooting of V for each Div M measure

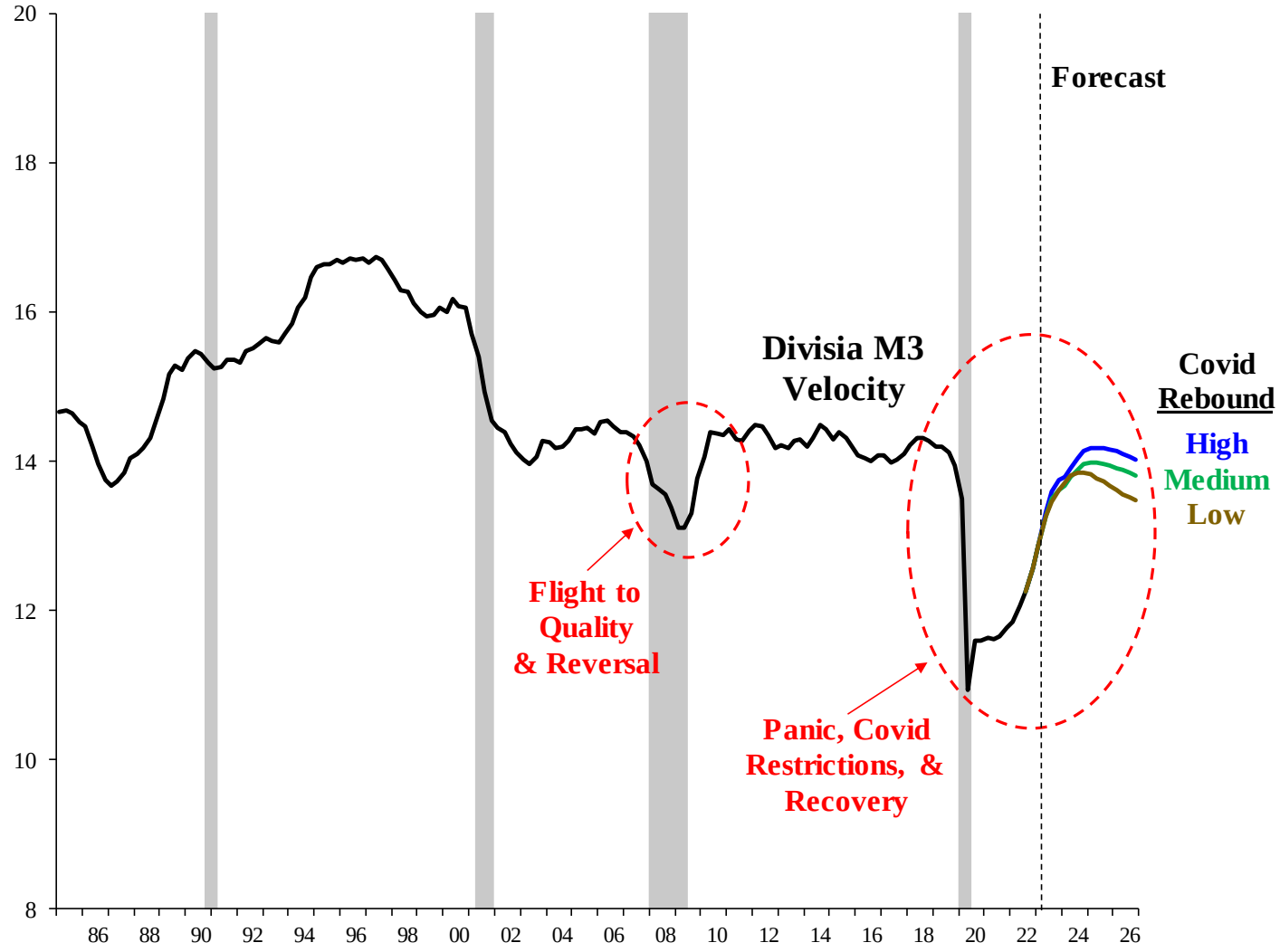


Figure 12: The Recovery of Divisia M3 Velocity Under Three COVID Scenarios

(Sources: CFS, BEA, Federal Reserve, and authors' calculations)

Interact Velocity Paths with Different Divisia Money Growth Scenarios to Forecast Nom GDP

- Take V paths as given, apply DivM3 growth as independent*
- Nom GDP = $V3^{forecast}$ x $M3^{path}$
- Note Div M3 has fallen an avg of 4% SAAR ‘22q4 & ’23q1
- Three DivM3 money growth paths
  - Modest: -4% ann. rate ‘23q2 & ‘23q3, flat ’23q4, 4% thereafter
  - Slow: -4% ann. rate ‘23q2 & ‘23q3, flat ’23q4, 2% in ‘24, 4% after
  - Partial retrenchment: -4% ann. rate 23q2 to 23q4, 0 in ‘24, 4% after
- Slow & moderate paths => 3 - 5% nom GDP growth ‘24/’25
- Partial retrenchment => negative nom GDP growth late 2024

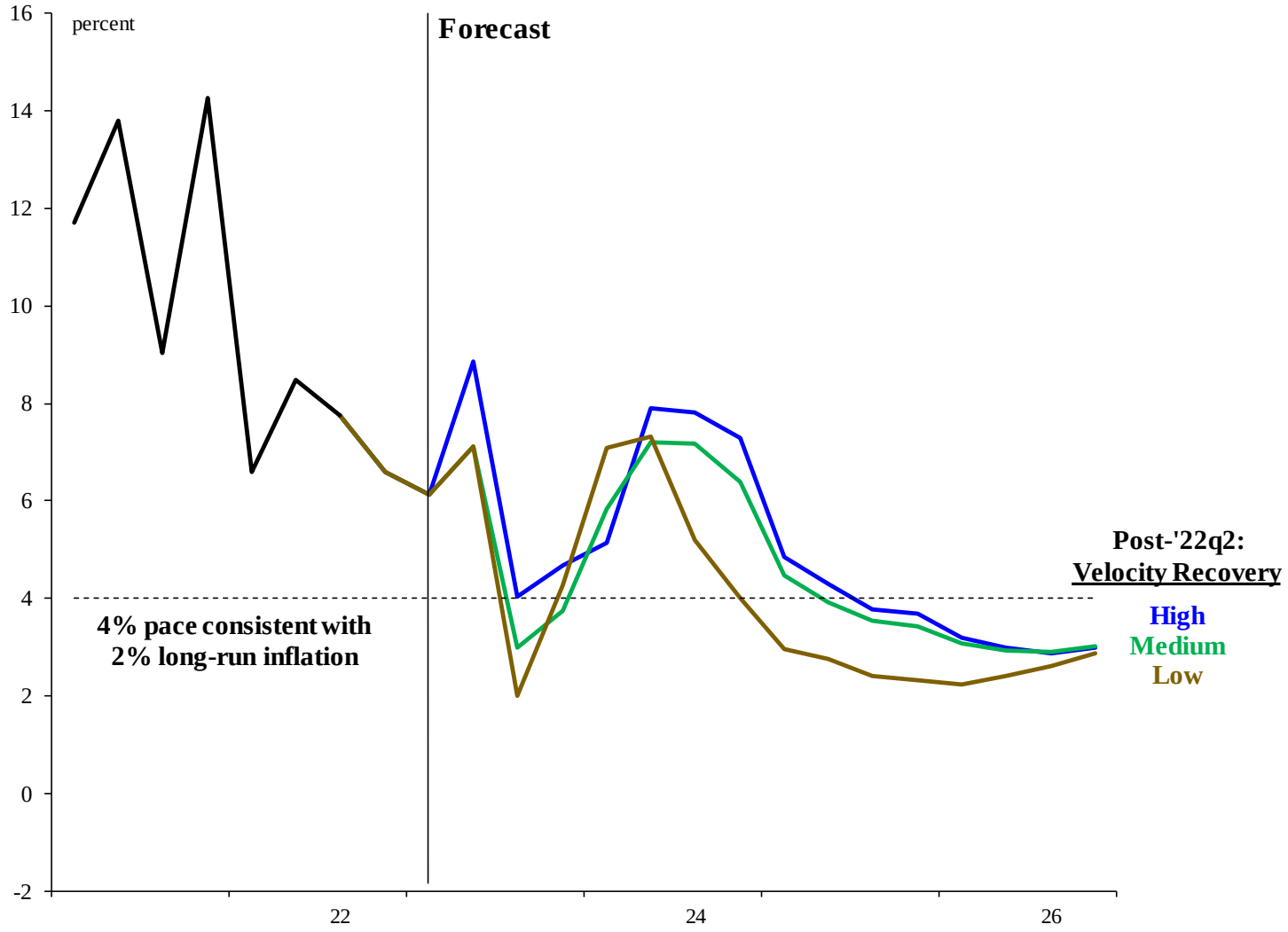


Figure 16: Nominal GDP Growth: Modest Divisia M3 Growth and Three Velocity Scenarios

(Sources: CFS, BEA, Federal Reserve, and authors' calculations)

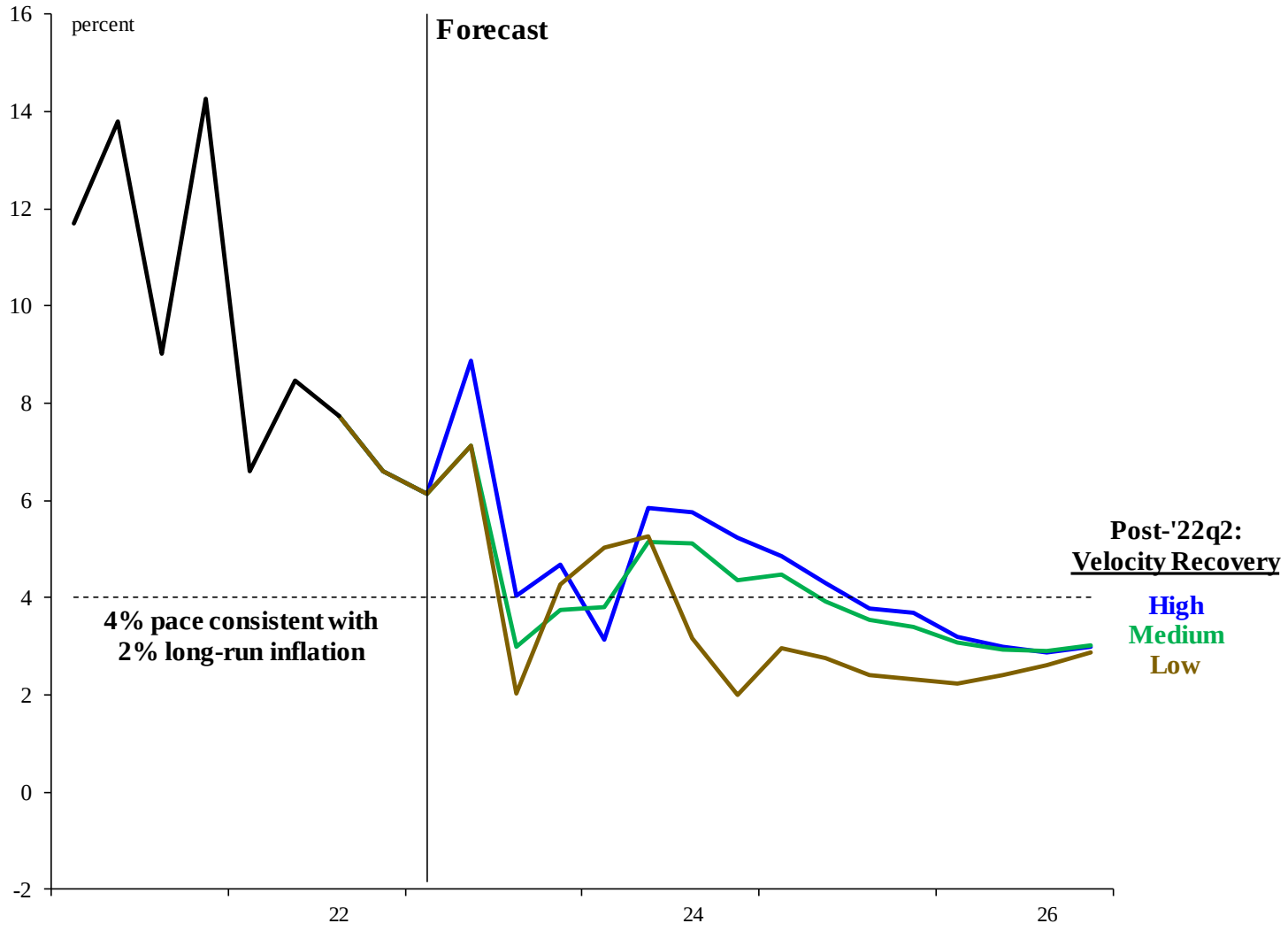


Figure 15: Nominal GDP Growth: Slow Divisia M3 Growth and Three Velocity Scenarios

(Sources: CFS, BEA, Federal Reserve, and authors' calculations)

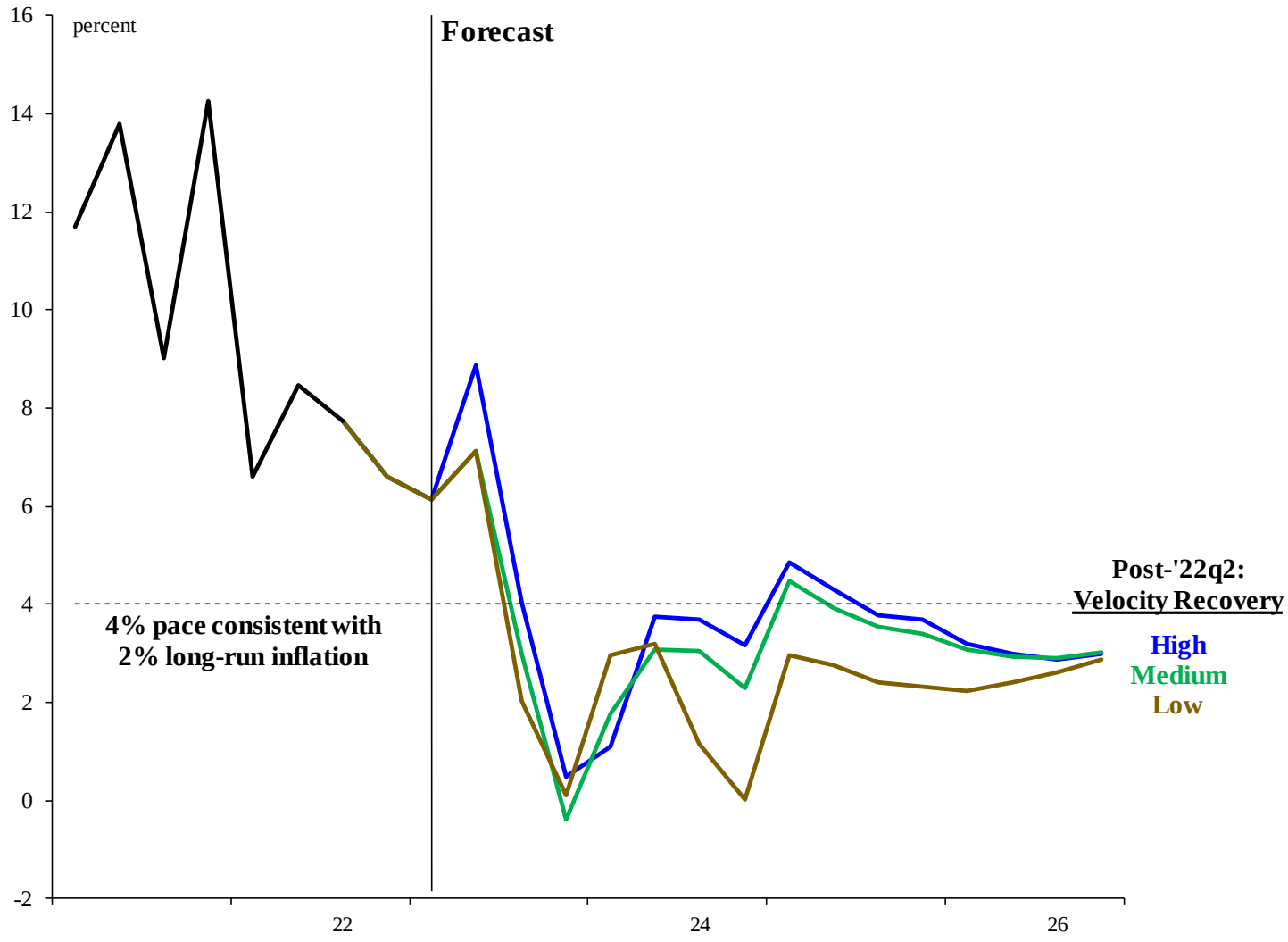


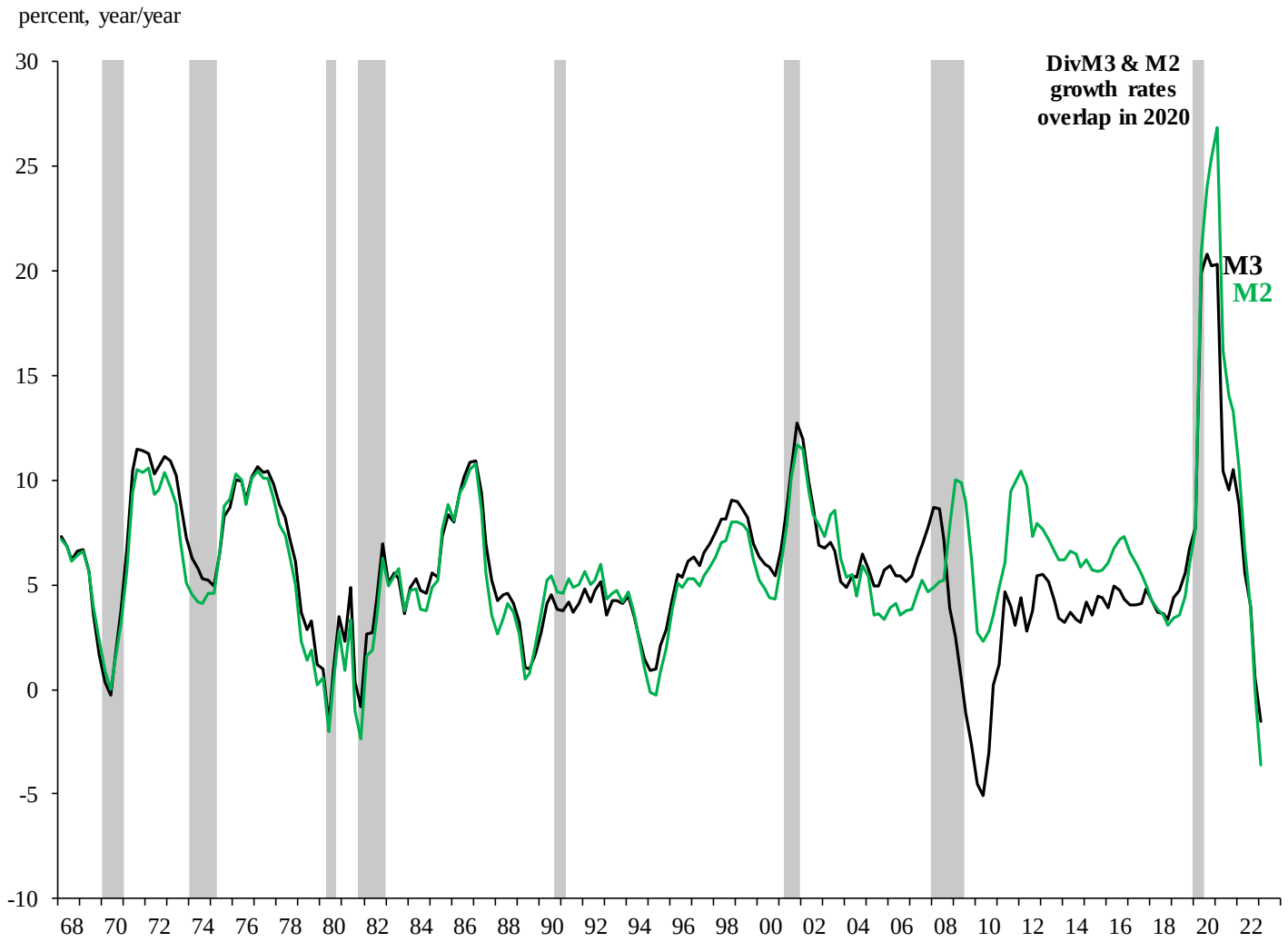
Figure 17: Nominal GDP Growth: Weak Divisia M3 Growth and Three Velocity Scenarios

(Sources: CFS, BEA, Federal Reserve, and authors' calculations)

Concluding Comments

- The recent post-COVID inflation was largely fueled by expansionary fiscal and monetary policies.
- The simple quantity theory explanation of "too much money chasing too few goods" was discredited in the 1980s and 1990s because of instability in money demand (velocity).
- This paper develops a Divisia M demand for money (velocity) function which is stable in the s-run and l-run.
- The evolution of Divisia M3 growth and its velocity can, with adjustments for COVID, help track the recent path of nom GDP.
- Lagged adjustment of Divisia velocity to uncertainty shocks of the pandemic helps explain the slow response of nominal GDP and inflation to the fiscal and monetary policy expansions of 2020-22.
- Suggests impact of recent Fed tightening will be drawn out.
- Our research suggests that there is information in broad Divisia money that should be considered along with other indicators.

Back-up Slides



Broad Divisia Money Much Weaker than M2 During the Subprime Bust

(Sources: Center for Financial Stability, Federal Reserve, and authors' calculations.)

Framework for Modeling MSI Velocity: Brief Overview of MSI Construction

- The nominal Divisia monetary index (DMI) is derived as a chained Törnqvist-Theil quantity index, and is defined as:

$$\mathrm{DMI}_t = DMI_{t-1} \prod_{i=0}^{n} \left(\frac{M_{it}}{M_{it-1}} \right)^{0.5(W_{it}+W_{it-1})}$$

where M_{it} is the nominal monetary asset I and W_{it} is the expenditure share of monetary asset i:

.

$$W_{it} = \frac{\pi_{it} M_{it}}{\sum_{j=1}^{n} \pi_{it} M_{jt}}$$

Framework for Modeling MSI Velocity: Brief Overview of MSI Construction

- $\pi_{it} \equiv$ user cost of money for asset *i*: scaled spread between outside benchmark rate (R) and pecuniary rate of return on asset i. The bigger is the spread, the larger are the nonpecuniary services from asset i, treated as monetary or liquidity services of an asset.

$$\pi_{it}^{n} = \frac{P_t(R_t - r_{it})}{(1+R_t)}$$

- Rate spread tracks how liquidity of asset i is evolves, perhaps arising from technology or regulation. If new assets are quickly counted, financial innovation should ***in theory*** be reflected in a bigger spread as agents get more nonpecuniary returns on asset i and are willing to accept lower pecuniary returns (r_i).

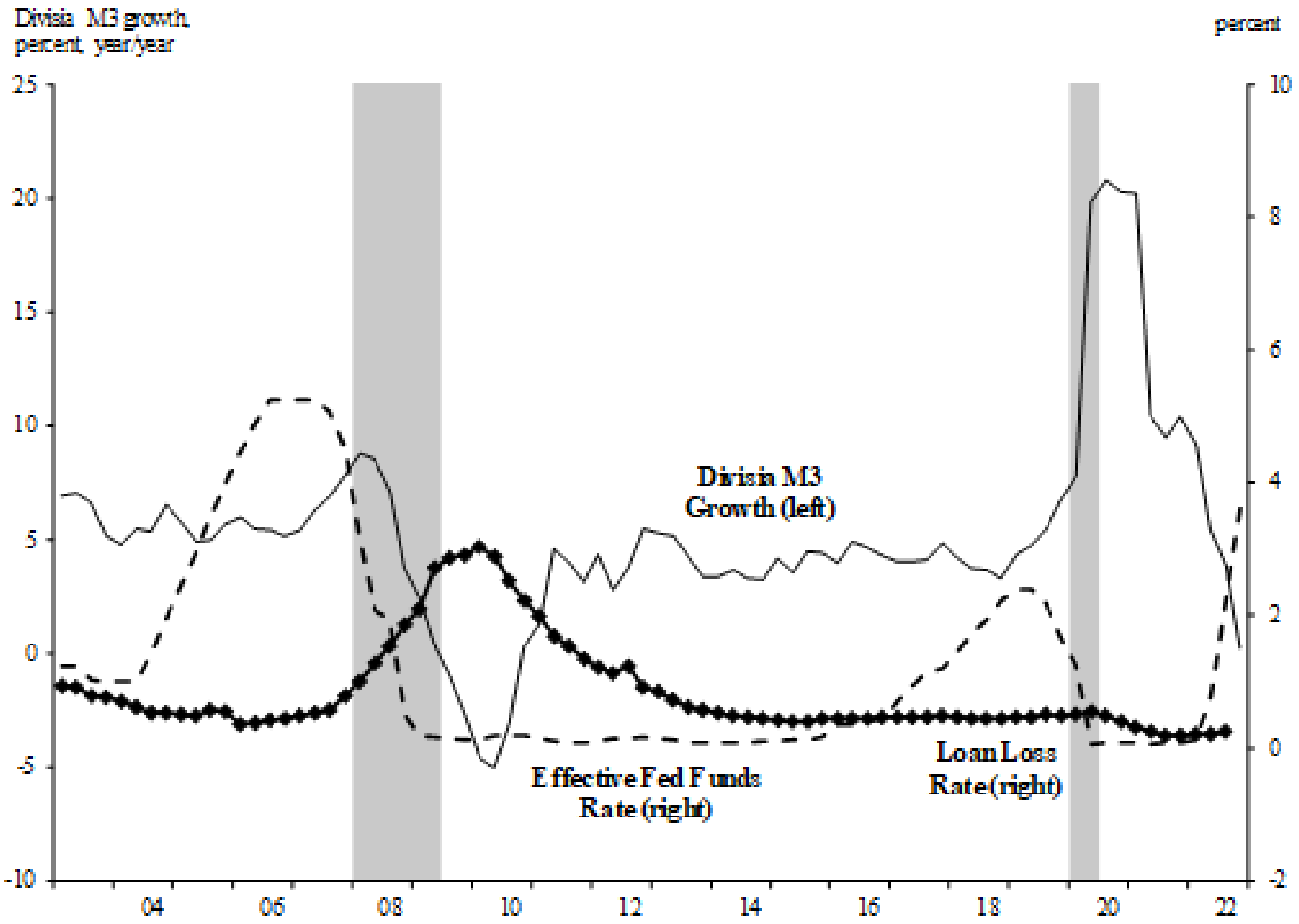


Figure 4: Divisia M3 Growth Also Affected by Loan Loss Rates
(Sources: CFS, Federal Reserve Board, and authors' calculations)

Long-Run Variables Are Negative (as expected), Significant, and Stable Pre- & Post COVID

Long-Run Relationship: $LVDiv_t = \alpha_0 + \alpha_1 LSLD1_t + \alpha_2 CFMA_t + \alpha_3 StringVax_t$

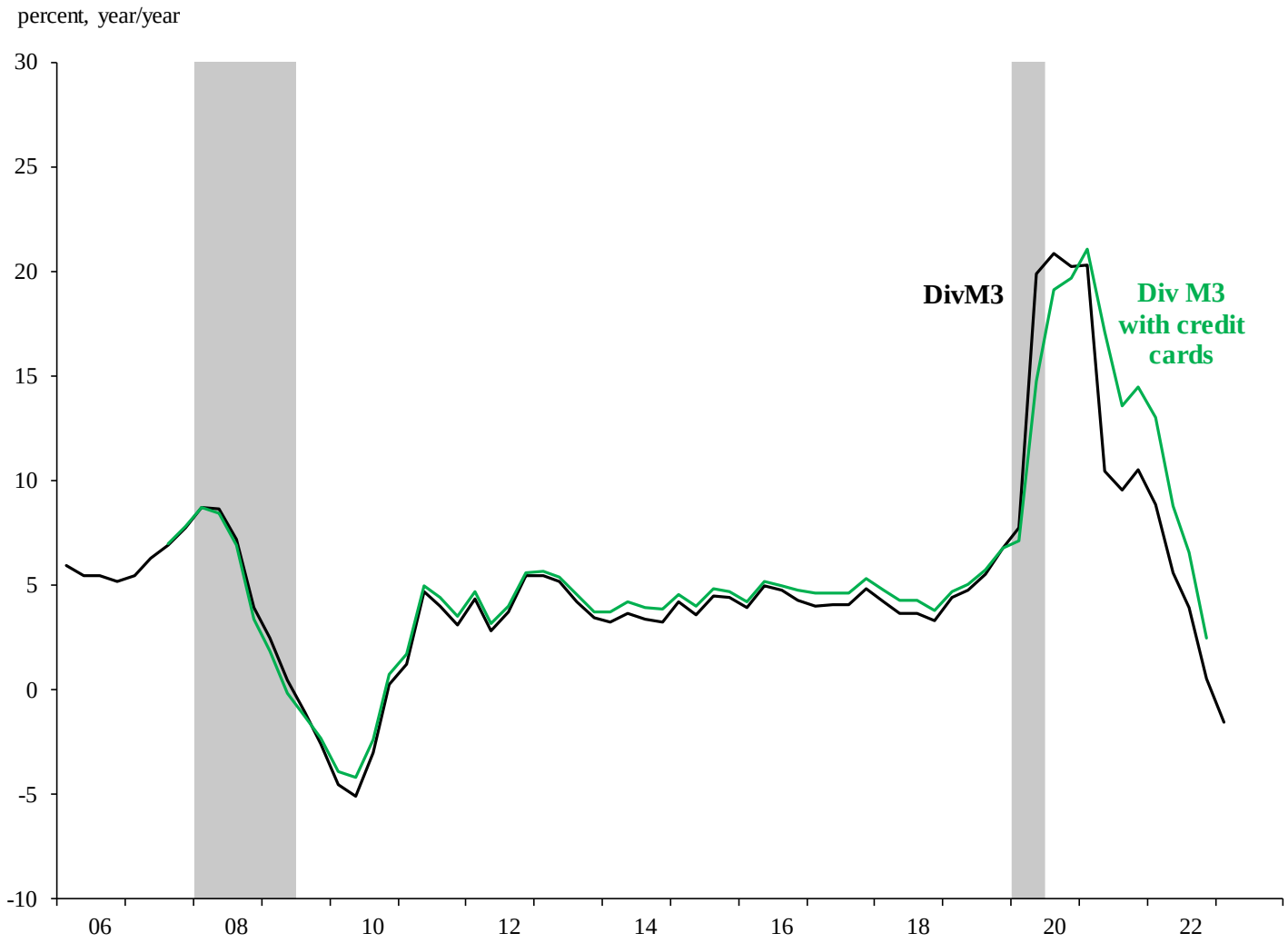
	V3Div	V3Div	V4-Div	V4-Div	V4+Div	V4+Div
Sample:	86:1-19:4	86:1-23:1	86:1-19:4	86:1-23:1	86:1-19:4	86:1-23:1
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Constant	3.044	3.049	2.945	2.986	2.872	2.911
$LSLD1_t$	-0.261**	-0.263**	-0.249**	-0.276**	-0.210**	-0.236**
	(12.77)	(14.48)	(7.38)	(6.89)	(9.23)	(7.27)
$CFMA_t$	-0.158**	-0.154**	-0.085*	-0.091**	-0.110**	-0.116**
	(16.40)	(17.45)	(4.31)	(4.55)	(8.51)	(7.27)
$StringVax_t$x100		-0.636**		-0.744+		-0.794*
		(3.40)		(1.83)		(2.29)
TraceCorr (1v.)	51.89**	67.76**	34.85*	50.42**	43.12**	52.44*
TraceCorr (2v)	13.12	21.13	7.18	21.81	7.76	23.37
Unique Coint-	Yes**	Yes**	Yes*	Yes*	Yes**	Yes*
Lag Length	5	5	9	6	9	6

Error-Correction (Sluggish Adjust.) Negative (as expected), Significant, Stable Pre- & Post COVID

S-Run: $\Delta LVDiv_t = \alpha_0 + \alpha_1(EC)_{t-1} + \beta_i\Delta(LVDiv)_{t-i} + \theta_i\Delta(LSLD1)_{t-i} + \varphi_i\Delta(CFMA)_{t-i} + \sigma_i\Delta(StringVax)_{t-i} + \delta S\text{-}runVar_t + \varepsilon_t$

Note: $EC_{t-1} \equiv \ln VDiv_{t-1} - \ln VDiv^*_{t-1}$

	V3Div	V3Div	V4-Div	V4-Div	V4+Div	V4+Div
Sample:	86q1-19q4	86q1-23q1	86q1-19q4	86q1-23q1	86q1-19q4	86q1-23q1
EC_{t-1}	-0.117**	-0.122**	-0.083**	-0.058**	-0.146**	-0.104**
	(4.60)	(4.47)	(3.69)	(3.05)	(5.04)	(3.68)
Adjusted R^2	.714	.934	.627	.904	.715	.911
S.E.	0.053	0.053	0.059	0.063	0.058	0.076
VECLM(1)	5.56	14.50	4.61	14.19	4.39	18.69
VECLM(4)	13.55	25.14	16.42	25.01	6.18	17.40



Growth Rates of Divisia Money With and Without Credit Card Services Similar

(Sources: CFS, Federal Reserve, and authors' calculations. Shaded areas are NBER recessions.)