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Insurance Performance Through Inflation Cycles

*A Quantitative Analysis from 1978 to 2021 and Roadmap for 2022-2025
including inflation and insurance replacement costs forecasts*

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CONTENT

Key Inflation Drivers Through Inflation Cycles

- ▲ Inflation Cycles
- ▲ Insight
- ▲ Pandemic
- ▲ 1983-2019
- ▲ Stagflation

Insurance Performance Through Inflation Cycles

- ▲ Replacement Costs
- ▲ Correlations
- ▲ Homeowners
- ▲ Personal Auto
- ▲ Commercial Multi-Perils
- ▲ Commercial Auto
- ▲ Medical Liability
- ▲ Workers Compensation

Roadmap: Inflation and Replacement Costs Forecasts

- ▲ Time Line
- ▲ Newest Normal
- ▲ Supply Chain
- ▲ Labor
- ▲ Political Risk
- ▲ Inflation Forecasts
- ▲ Replacement Costs Forecast

Key Insight

Inflation Cycles

- ▲ 2020-21 YoY U.S. CPI not comparable to stagflation
- ▲ 2020-21 YoY increase in insurance replacement costs in-line with average stagflation CPI

Inflation and Insurance Performance

- ▲ Weak statistical relationship between inflation/replacement costs, CR, and NWP
- ▲ NWP/CR statistical relationship to other lines' stronger than to CPI/replacement costs

Challenge: Linear statistics does not fully price impact of inflation on CR and NWP

Opportunity: Better price inflation (and economic indicators) into actuarial tables and planning assumptions by leveraging machine learning

Inflation Drivers Through Cycles

Section 1

Inflation Cycles

Inflation Drivers Through Cycles

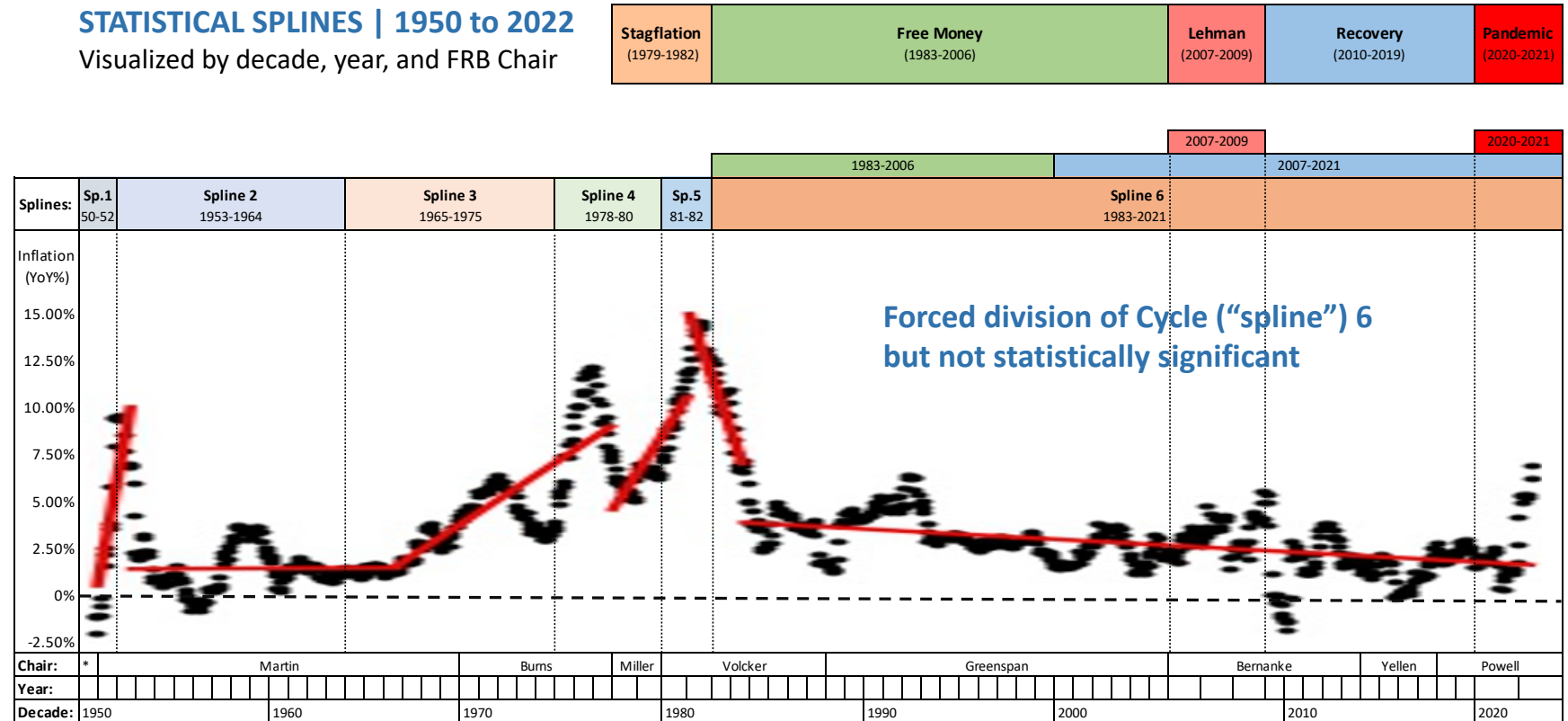
Six statistically significant inflation cycles from 1950 to 2022

We divided inflation periods post-1978 as follows:

- Stagflation
- Free Money
- Lehman
- Recovery
- Pandemic

No new cycle since Volker broke stagflation in 1982

STATISTICAL SPLINES | 1950 to 2022
Visualized by decade, year, and FRB Chair



Source: Data FRED; Chart & Analysis: Triple-I

Pandemic inflation rate aligned with last 40 years: not stagflation

Used vehicles and construction prices increase most during economic stress

New vehicles, medical, and housing prices remain closest to average across cycles

Apparel and furnishings lag inflation across cycles and more so during economic stress

Housing increases during pandemic out of trend

Average Annual Inflation by Cycle (YoY%)							
Cycles	All Urban	Used Vehicles	New Vehicles	Housing	Apparel	Construction	Medical
Stagflation	10.7%	13.7%	7.3%	10.9%	4.6%	8.1%	10.7%
Free Money	3.1%	1.8%	1.8%	3.3%	0.6%	2.0%	4.7%
Pandemic	3.0%	14.9%	3.2%	2.7%	-1.1%	8.7%	1.8%
Lehman	2.1%	-3.1%	-0.5%	2.7%	0.2%	2.3%	3.4%
Recovery	1.8%	1.1%	0.8%	2.5%	0.3%	2.1%	2.7%

Assigned color and ranking vary slightly across cycles based on CPI distribution

Source: Data FRED; Chart & Analysis: Triple-I

CPI Drivers
High
Medium High
Average
Medium Low
Lowest

Pandemic

Inflation Drivers Through Cycles

2019-21 annual average inflation is 3.0%, below post-1978's 4.1% and above post 1982's 2.5%

2020-21 YoY Inflation estimated at 4.

Inflation reached 7.5% on 12-month basis in Q4 2021

Because of falling prices in Q1/Q2 2020, this is higher than total 2019-2021 6% inflation

Pandemic			
Ave. Yearly Inflation 2019-21 (YoY%)			
Rank	Key Component	Per Item (YoY%)	Per Tier (YoY%)
1	Used Vehicles	14.9%	11.5%
2	Gas, All Types	11.0%	
3	Construction	8.7%	
4	Durables	5.7%	4.3%
5	Transportation	5.3%	
6	New Vehicles	3.2%	
7	Food	3.2%	
All Urban		3.0%	
8	Housing	2.7%	1.5%
9	Electricity	2.4%	
10	Medical	1.8%	
11	Apparel	-1.1%	

Pandemic Yo2Y%			
Total Inflation from 2019 to 2021 (Yo2Y%)			
Rank	Key Component	Per Item (YoY%)	Per Tier (YoY%)
1	Used Vehicles	30.6%	21.5%
2	Gas, All Types	16.2%	
3	Construction	17.7%	
4	Durables	11.6%	8.6%
5	Transportation	10.0%	
6	New Vehicles	6.4%	
7	Food	6.5%	
All Urban		6.0%	
8	Housing	5.4%	2.9%
9	Electricity	4.9%	
10	Medical	3.7%	
11	Apparel	-2.4%	

CPI Drivers
High
Medium High
Average
Medium Low
Lowest

Assigned color and ranking vary slightly across cycles based on CPI distribution

Source: Data FRED; Chart & Analysis: Triple-I

1983 to 2019

Inflation Drivers Through Cycles

Free Money, Lehman and Pandemic are one single cycle and monetary regime

This cycle is characterized by an overall downward CPI trend with relatively even distribution above and below average

Free Money			
Ave. Yearly Inflation 1983 to 2006 (YoY%)			
Rank	Components	Per Item	Per Tier
1	Medical	4.7%	4.0%
2	Housing	3.3%	
All Urban		3.0%	
3	Transportation	2.9%	
4	Gas, All Types	2.9%	
5	Food	2.8%	
6	Electricity	2.2%	
7	Construction	2.0%	
8	New Vehicles	1.8%	
9	Used Vehicles	1.8%	1.3%
10	Durables	0.8%	
11	Apparel	0.6%	

Lehman			
Ave. Yearly Inflation from 2007-09 (YoY%)			
Rank	Components	Per Item	Per Tier
1	Electricity	4.0%	
2	Food	3.6%	
3	Medical	3.4%	
4	Housing	2.7%	3.2%
5	Construction	2.3%	
All Urban		2.1%	
6	Gas, All Types	1.5%	
7	Apparel	0.2%	
8	Transportation	0.2%	
9	New Vehicles	-0.5%	-0.5%
10	Durables	-1.5%	
11	Used Vehicles	-3.1%	

Recovery			
Ave. Yearly Inflation from 2010-19 (YoY%)			
Rank	Components	Per Item	Per Tier
1	Gas, All Types	3.0%	
2	Medical	2.7%	
3	Housing	2.5%	
4	Construction	2.1%	2.4%
5	Food	1.8%	
All Urban		1.8%	
6	Transportation	1.7%	
7	Used Vehicles	1.1%	
8	Electricity	1.0%	
9	New Vehicles	0.8%	0.7%
10	Apparel	0.3%	
11	Durables	-0.7%	

CPI Drivers
High
Medium High
Average
Medium Low
Lowest

Assigned color and ranking vary slightly across cycles based on CPI distribution

Source: Data FRED; Chart & Analysis: Triple-I

Stagflation

Inflation Drivers Through Cycles

1978-98 average yearly CPI 10.7%, three+ times the pandemic's 3.0%

However, average inflation for used vehicles and construction comparable at app. 14% and 8% respectively

Food, energy, and medical not elevated during pandemic as they were during stagflation

Stagflation			
Average Yearly Inflation 1979 to 1982 (YoY%)			
Rank	Key Component	Per Item (YoY%)	Per Tier (YoY%)
1	Gas, All Types	14.1%	13.4%
2	Used Vehicles	13.7%	
3	Electricity	13.6%	
4	Transportation	12.2%	
5	Housing	10.9%	10.8%
6	Medical	10.7%	
All Urban		10.7%	
7	Durables	9.1%	7.5%
8	Food	8.6%	
9	Construction	8.1%	
10	New Vehicles	7.3%	
11	Apparel	4.6%	

Pandemic	
Ave. Inflation 2020-21 (YoY%)	
Key Component	Per Item (YoY%)
Used Vehicles	14.9%
Gas, All Types	11.0%
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Housing	2.7%
Electricity	2.4%
Medical	1.8%
Apparel	-1.1%

CPI Drivers
High
Medium High
Average
Medium Low
Lowest

Assigned color and ranking vary slightly across cycles based on CPI distribution

Source: Data FRED; Chart & Analysis: Triple-I

Insurance Performance Through Inflation Cycles

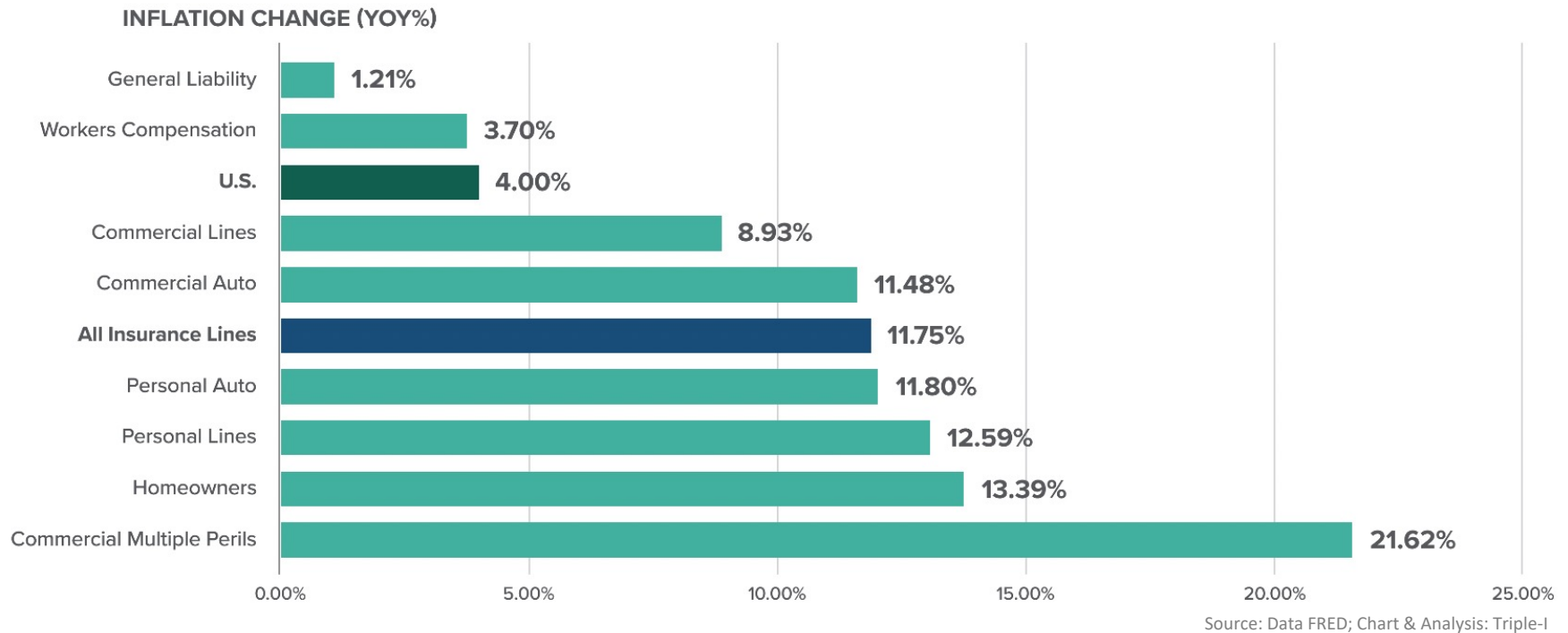
Section 2

Replacement Costs

Insurance Performance Through Inflation Cycles



2020-21 replacement costs 11.75% versus 4.61% for overall U.S. inflation



Insurance replacement costs aligned with stagflation

Correlations

Insurance Performance Through Inflation Cycles

EXPECTED

- ▲ Inflation volatility more significant performance driver than inflation cycle
- ▲ Workers Comp NWP driven by both wages

UNEXPECTED

- ▲ Homeowners' performance indicates stronger relationship to durables prices than building material or equipment's >> wider commodity base?
- ▲ Personal and commercial auto CRs more strongly related to used auto prices than to new auto's >> Used auto's higher price volatility through economic cycles?
- ▲ Workers Comp CR shows little relationship with economic cycles >> Unemployment lag? Lack of wages sensitivity to economic cycles?

NEUTRAL EXPECTATIONS

- ▲ NWP for commercial auto less vulnerable to economic cycles than personal auto's >> longer term expenditures and planning?
- ▲ Medical liability CR performance has stronger relationship to economic cycles than underlying costs >> underlying price stability due to long-terms contracts?

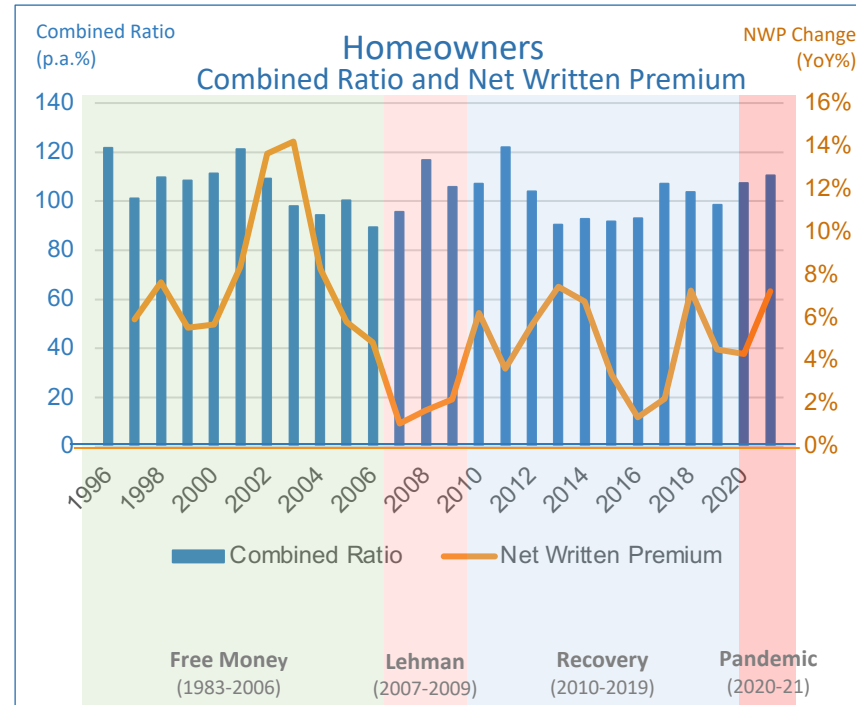
Homeowners

Insurance Performance Through Inflation Cycles

CR relationship to durables prices stronger than to shelter's (*unexpected*)

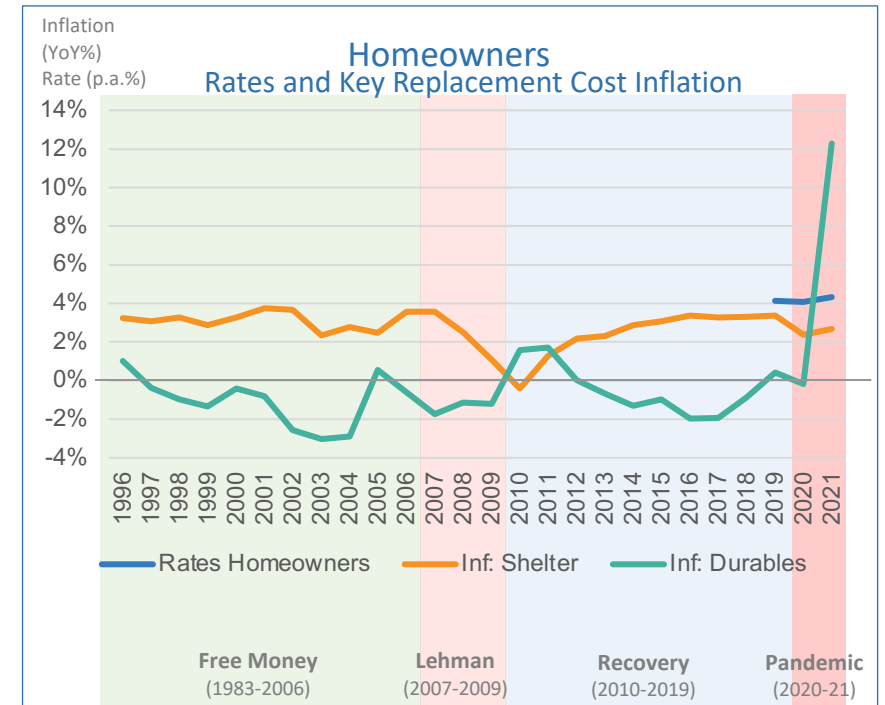
NWP relationship to durables prices stronger than to shelter's (*unexpected*)

CR outperforming during low inflation volatility as opposed to CPI trend (*expected*)



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

Shaded areas' colors identify inflation cycles. They do not indicate inflation range or scale during each cycle.



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

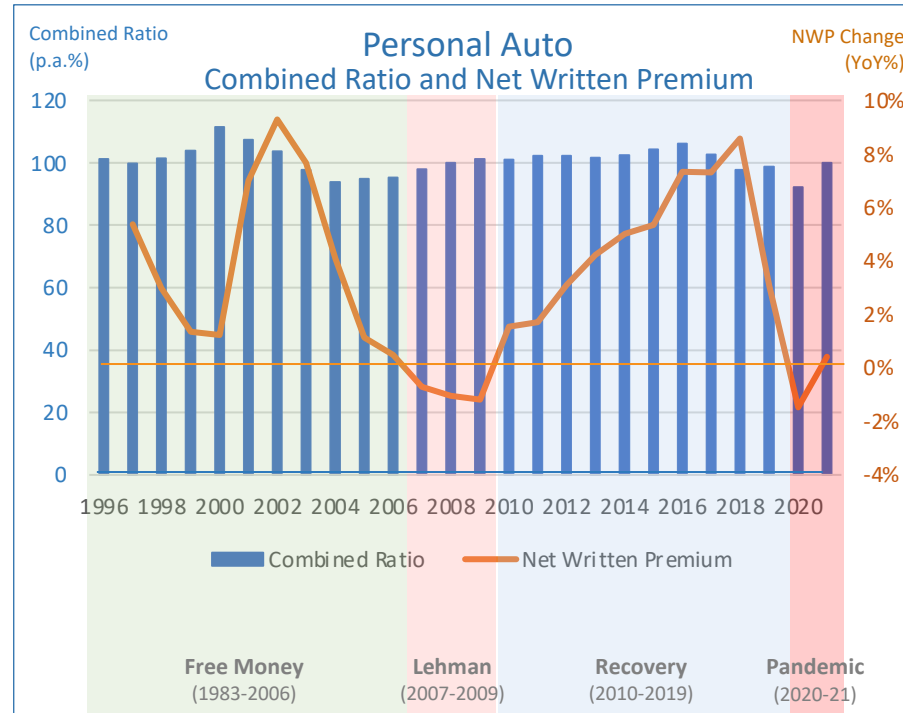
Personal Auto

Insurance Performance Through Inflation Cycles

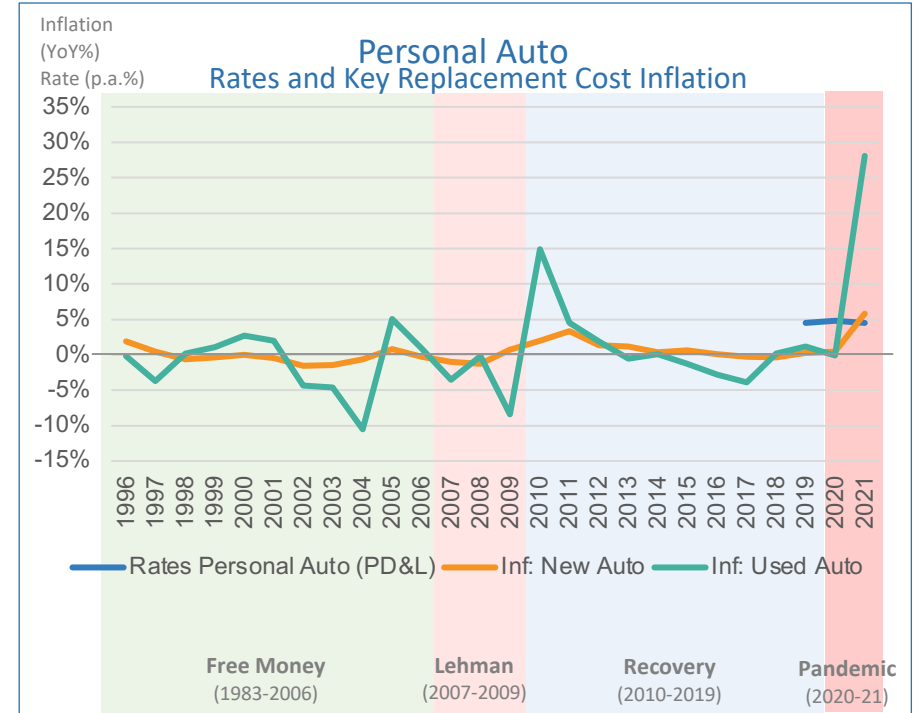
CR relationship to used auto prices stronger than to new auto's (*unexpected*)

NWP relationship to new auto prices stronger than to used auto's (*expected*)

CR performance more related to overall growth than to inflation volatility (*expected*)



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

Shaded areas' colors identify inflation cycles. They do not indicate inflation range or scale during each cycle.

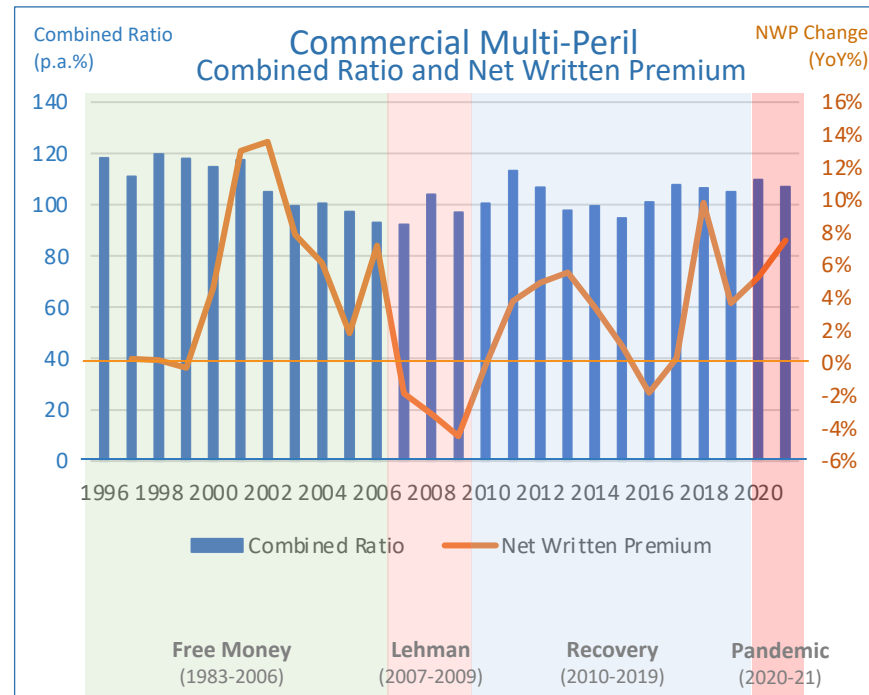
CMP

Insurance Performance Through Inflation Cycles

CR relationship to materials prices stronger than to equipment's *(expected)*

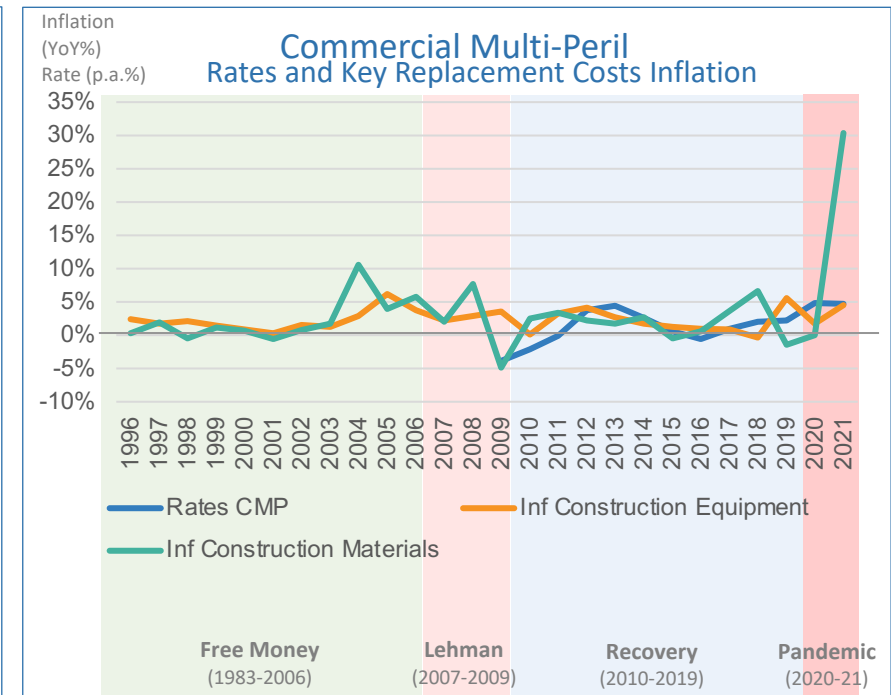
NWP relationship to material prices stronger than to equipment's *(expected)*

CR performance less related to inflation volatility than other lines' *(unexpected)*



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout;
Chart & Analysis: Triple-I

Shaded areas' colors identify inflation cycles. They do not indicate inflation range or scale during each cycle.



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout;
Chart & Analysis: Triple-I

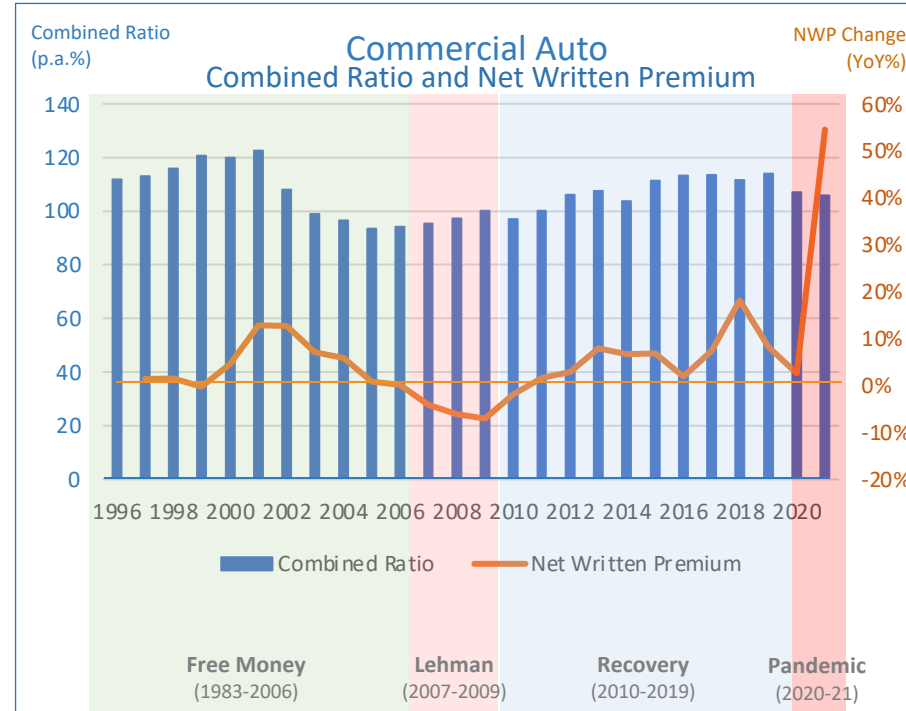
Commercial Auto

Insurance Performance Through Inflation Cycles

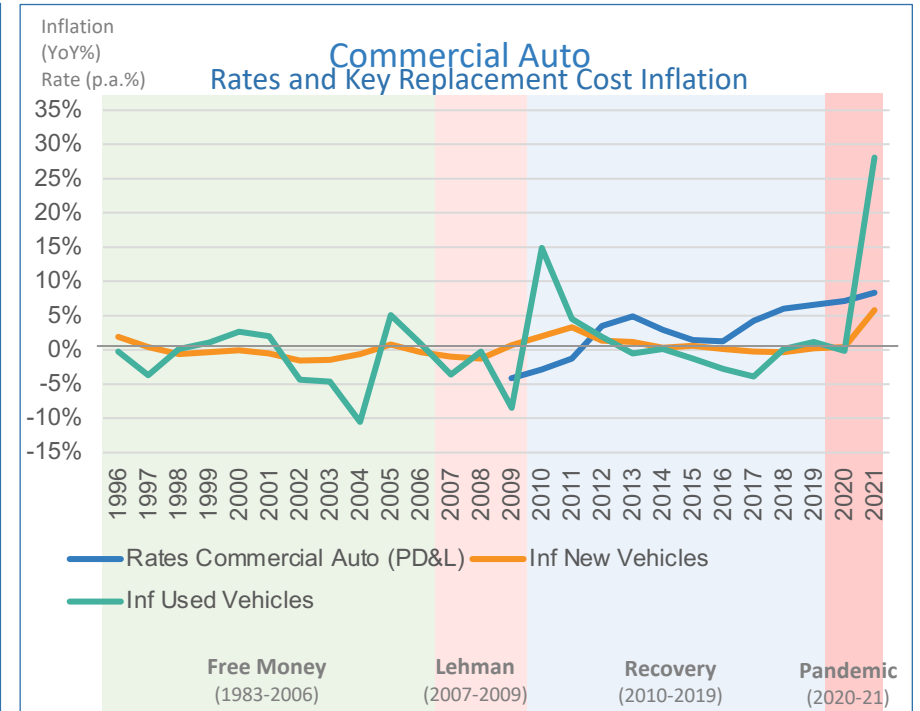
CR relationship to used auto prices stronger than to new auto's (*unexpected*)

NWP relationship to used auto prices stronger than to new auto's (*unexpected*)

CR performance shows limited relationship to inflation volatility or overall economic growth (*unexpected*)



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

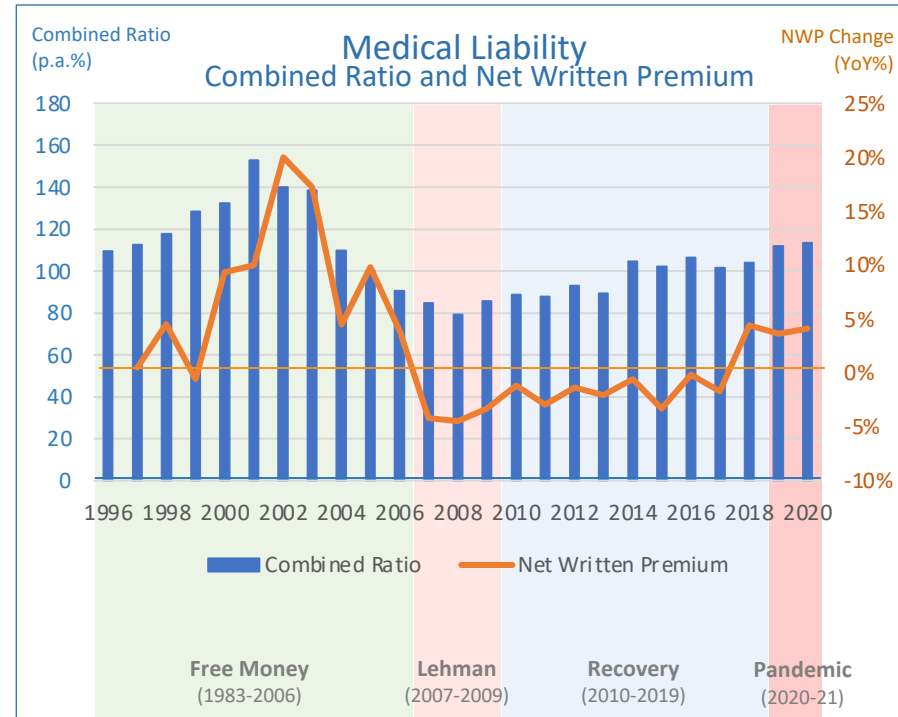
Medical Liability

Insurance Performance Through Inflation Cycles

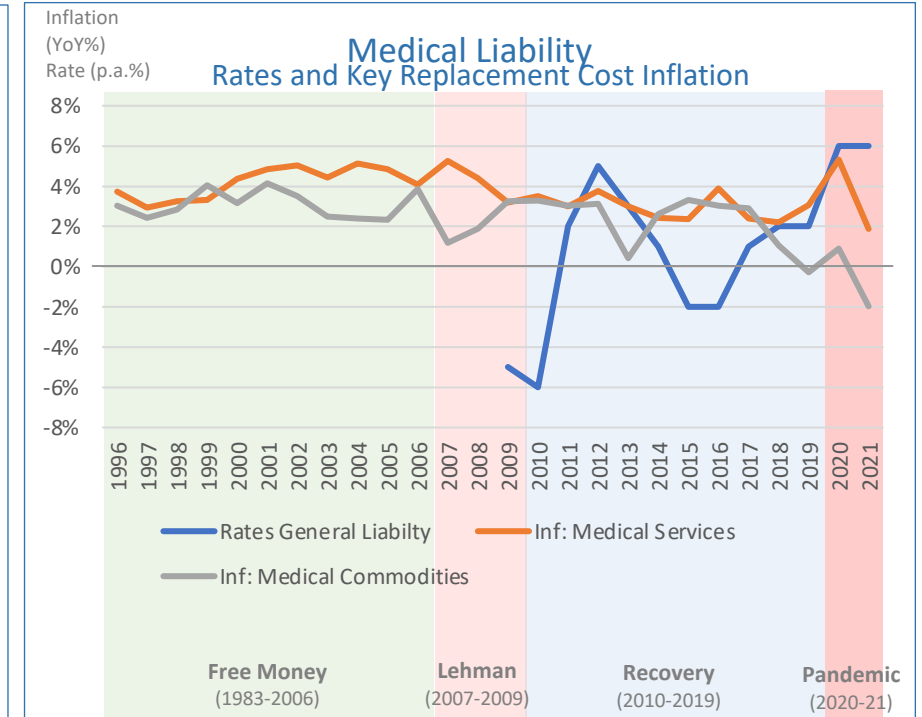
CR has weaker relationship to related CPI components than other lines' *(expected)*

NWP relationship to medicals services prices stronger than to medical commodities' *(expected)*

CR outperforming during expansionary economic cycles *(expected)*



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

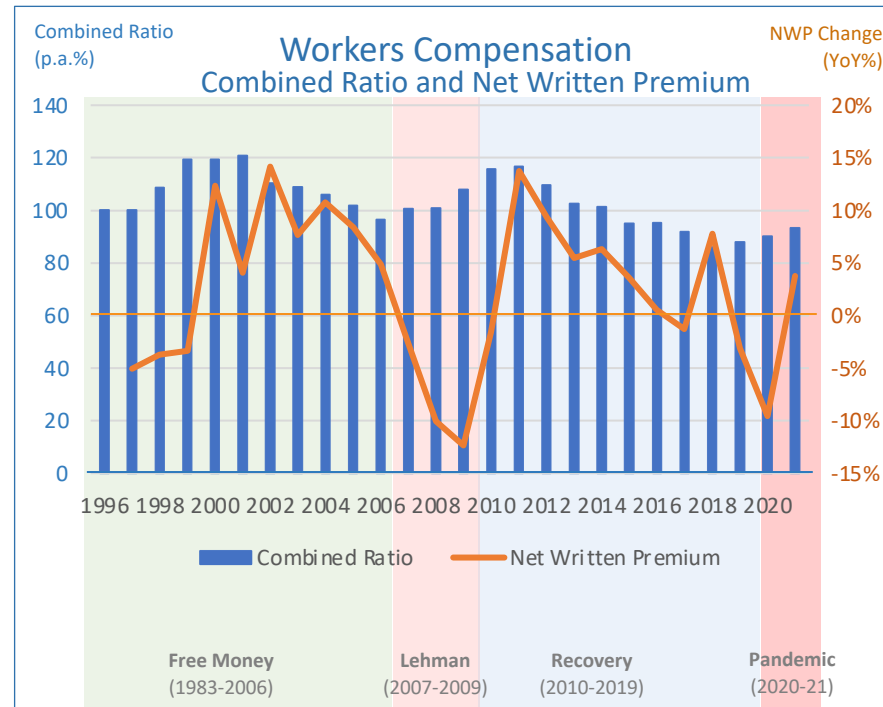
Workers Comp

Insurance Performance Through Inflation Cycles

CR relationship to payrolls stronger than to wages *(neutral)*

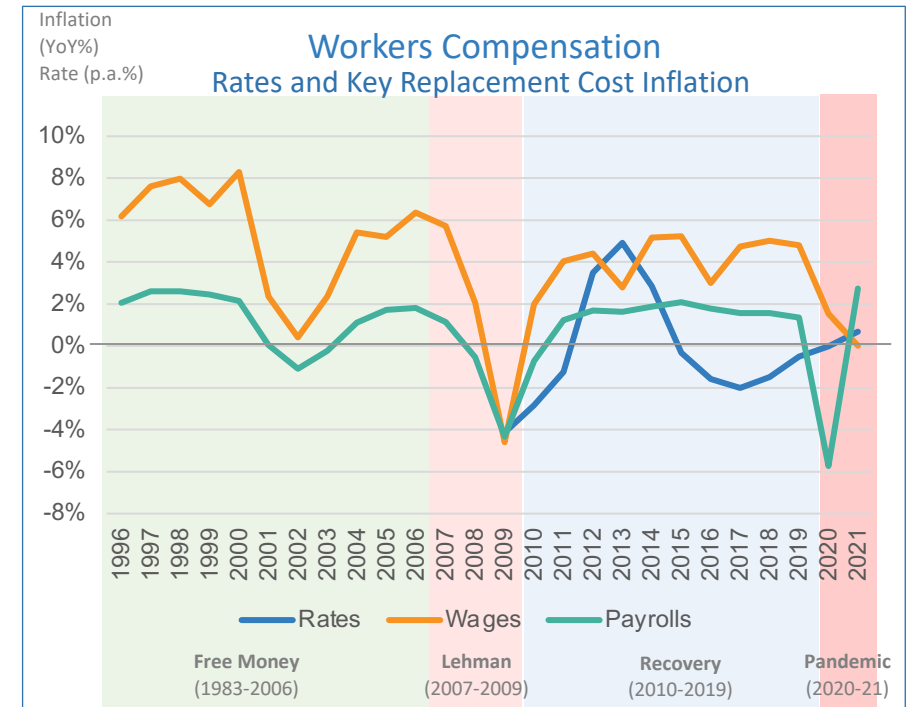
NWP has is driven by both payroll and wages *(expected)*

CR performance shows limited relationship to inflation volatility or overall economic growth *(unexpected)*



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout;
Chart & Analysis: Triple-I

Shaded areas' colors identify inflation cycles. They do not indicate inflation range or scale during each cycle.



Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout;
Chart & Analysis: Triple-I

Correlations

Insurance Performance Through Inflation Cycles

Correlation Matrix: Insurance Net Written Premium, Combined Ratio, and Key Inflation Components (Traditional Linear Regression)

Variables	Home NWP	Home CR	Inf Shelter	Inf Durables	P Auto NWP	P Auto CR	Inf New Vehicles	Inf Used Vehicles	CMP NWP	CMP CR	Inf Cons Equip	Inf Cons Mat	C Auto NWP	C Auto CR	Inf New Vehicles	Inf Used Vehicles	Med NWP	Med CR	Inf Med Ser	Inf Med Comm	WC NWP	WC CR	Payrolls	Wages
Home NWP	1.00																							
Home CR	0.03	1.00																						
Inf Shelter	0.08	-0.14	1.00																					
Inf Durables	-0.05	0.28	-0.20	1.00																				
P Auto NWP	0.54	-0.12	0.39	-0.12	1.00																			
P Auto CR	-0.04	0.30	0.13	-0.04	0.29	1.00																		
Inf New Vehicles	-0.15	0.25	-0.43	0.88	-0.13	0.02	1.00																	
Inf Used Vehicles	0.03	0.28	-0.29	0.90	-0.10	0.07	0.77	1.00																
CMP NWP	0.74	0.11	0.32	0.11	0.53	-0.02	-0.01	0.13	1.00															
CMP CR	0.16	0.76	0.16	0.15	0.10	0.38	0.12	0.15	0.17	1.00														
Inf Cons Equip	-0.16	-0.11	-0.07	0.37	-0.43	-0.41	0.35	0.19	-0.12	-0.23	1.00													
Inf Cons Mat	0.11	0.04	0.01	0.76	0.08	-0.24	0.55	0.66	0.23	-0.06	0.25	1.00												
C Auto NWP	0.56	0.02	0.41	0.28	0.76	0.12	0.16	0.25	0.80	0.20	-0.20	0.38	1.00											
C Auto CR	0.06	0.30	0.45	-0.03	0.40	0.64	-0.08	-0.02	0.16	0.71	-0.42	-0.24	0.41	1.00										
Inf New Vehicles	-0.15	0.25	-0.43	0.88	-0.13	0.02	1.00	0.77	-0.01	0.12	0.35	0.55	0.16	-0.08	1.00									
Inf Used Vehicles	0.03	0.28	-0.29	0.90	-0.10	0.07	0.77	1.00	0.13	0.15	0.19	0.66	0.25	-0.02	0.77	1.00								
Med NWP	0.82	0.11	0.31	-0.31	0.44	-0.02	-0.47	-0.09	0.72	0.17	-0.08	-0.04	0.52	0.11	-0.47	-0.09	1.00							
Med CR	0.66	0.24	0.45	-0.33	0.51	0.34	-0.43	-0.13	0.59	0.52	-0.37	-0.27	0.56	0.62	-0.43	-0.13	0.77	1.00						
Inf Med Ser	0.16	0.06	0.12	-0.41	-0.28	-0.23	-0.49	-0.34	0.17	-0.08	0.04	-0.25	-0.30	-0.27	-0.49	-0.34	0.48	0.27	1.00					
Inf Med Comm	0.04	0.14	-0.03	-0.59	0.06	0.39	-0.42	-0.43	-0.08	0.15	-0.38	-0.58	-0.34	0.12	-0.42	-0.43	0.14	0.29	0.25	1.00				
WC NWP	0.52	-0.07	0.15	-0.03	0.47	0.19	0.07	0.05	0.65	-0.02	-0.02	0.15	0.51	-0.05	0.07	0.05	0.48	0.28	0.08	0.17	1.00			
WC CR	0.30	0.42	-0.31	-0.15	-0.12	0.49	-0.06	0.01	0.07	0.35	-0.19	-0.25	-0.24	0.11	-0.06	0.01	0.21	0.35	0.30	0.59	0.28	1.00		
Payrolls	0.02	-0.16	0.40	0.19	0.34	0.29	0.16	0.22	0.01	0.15	0.08	0.30	0.26	0.26	0.16	0.22	-0.11	0.03	-0.42	-0.02	0.41	-0.01	1.00	
Wages	-0.05	-0.14	0.45	-0.21	0.03	0.07	-0.22	-0.12	-0.05	0.29	-0.10	-0.11	0.00	0.28	-0.22	-0.12	-0.03	0.13	-0.03	0.19	0.26	0.01	0.71	1.00

Logic-driven assumptions not fully captured by traditional linear regression analysis

Significant: Positive $1 > 0.5$

Not Significant $0.5 > -0.5$

Significant: Negative $-0.5 > -1$

Source: Economic Data FRED, NWP & CR Data: S&P, Matrix table & analysis: Triple-I

Roadmap to 2022-2025

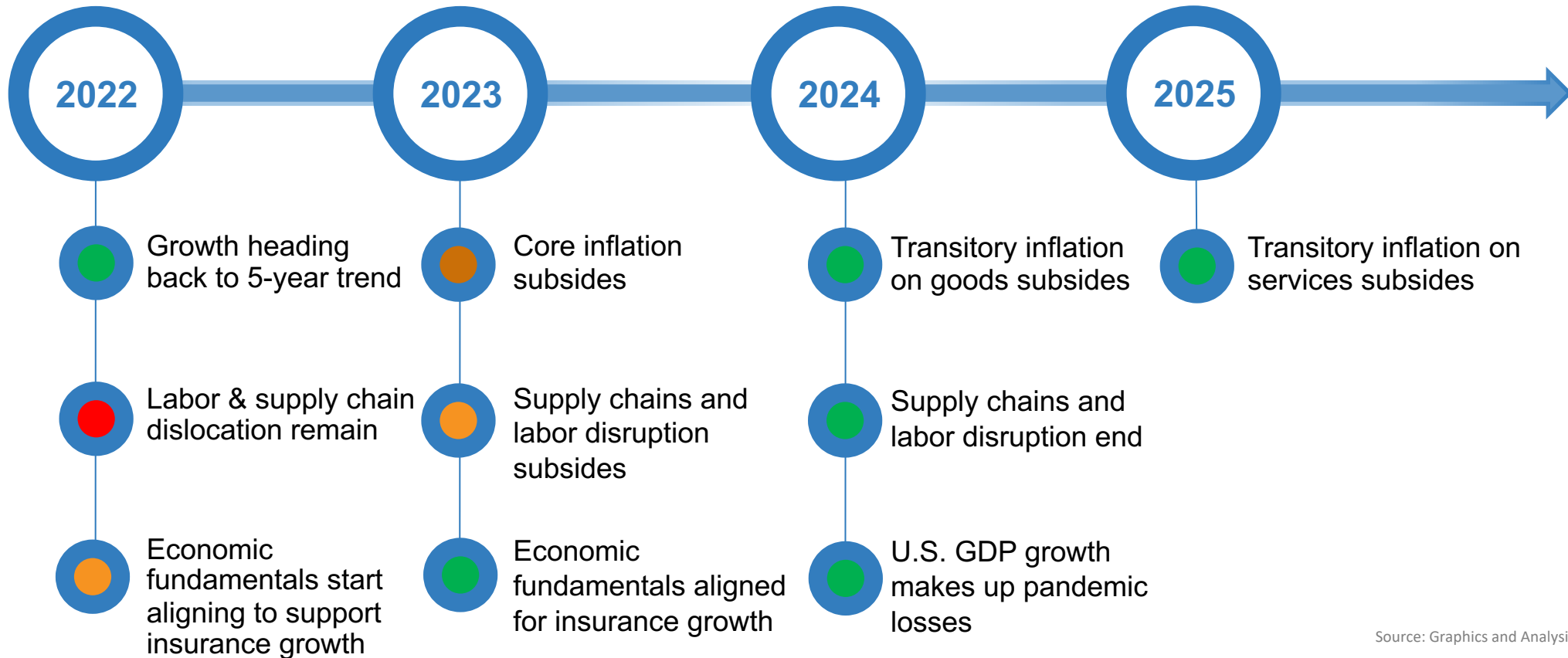
Inflation and Replacement Costs Forecasts

Section 3

Timeline

Roadmap 2022-2025

Macroeconomic drivers of insurance performance returning to growth alignment starting Q3 2022 and peaking in Q2 2023



Source: Graphics and Analysis: Triple-I

Newest Normal

Roadmap 2022-2025



New inflation and growth regime emerging as pandemic-economics normalizing

Quantifying relationship between economic metrics and insurance underlying growth and replacement costs key to carriers & reinsurers performance

- ▲ **Lesson Learned:** Single view of growth and inflation no longer adequate in newest normal
- ▲ **Inflation Types:** Transitory, Rural and urban, state & state specific
- ▲ **Labor:** Shortages and disruptions likely to last until 2024
- ▲ **Supply Chains:** Bottlenecks and higher shipping rates not back to normal until 2023-2024
- ▲ **Threats to Recovery:** Significant economic, pandemic, and geo-political threats to recovery remain

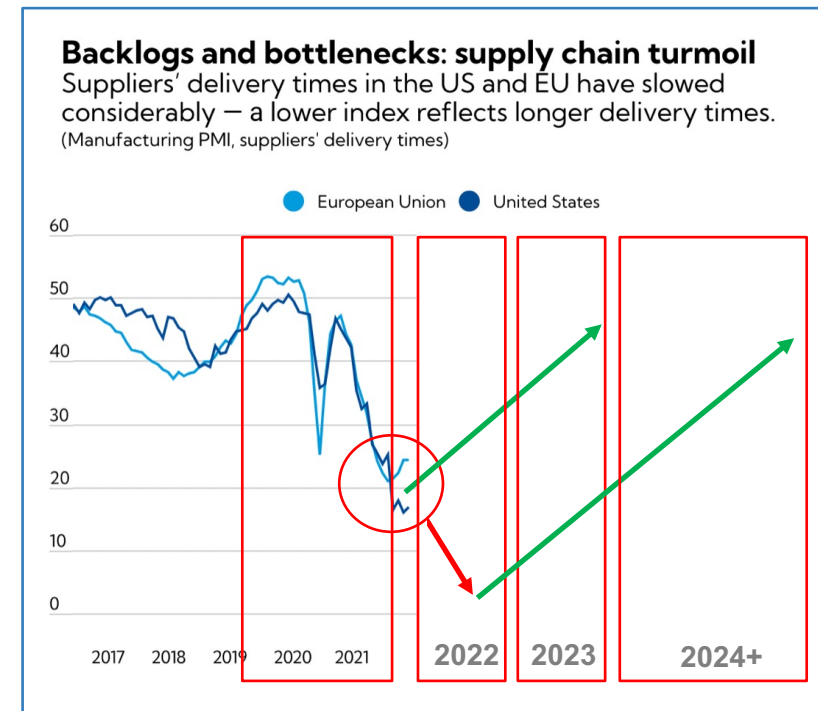
Greenspan's free money was predicated on influx of low cost labor, goods, and free trade. Influx of low cost labor is nearing its end and the global supply chains required for low cost goods are threatened by COVID and trade wars. While COVID subsides trade wars will likely shape inflation trends post pandemic.



Shipping travel time up 100% and rates up 600% since Q1 2020

Spike in consumer consumption approaching shipping capacity and pandemic labor and border disruptions push containerized shipping delays and rates to historic highs

- ▲ Best case scenario: shipping delays and rates back to normal by Q1 2023
- ▲ Likely scenario: shipping times and rates back to normal by 2023-2024
- ▲ Recent Indicator: Containerized shipping price decreased 1% week-over-week for 11-Nov-18



Source: IMF; Table and Analysis: Triple-I 2021



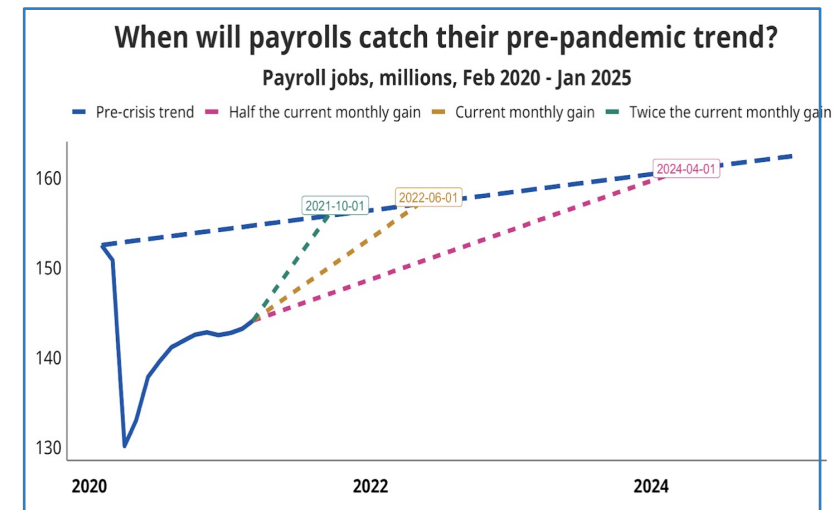
Lasting impact on cost of labor post-pandemic

Cost of labor likely to remain significantly elevated into 2024 in residential construction and motor vehicle services

- Best case scenario employment rate to recover by Q4 2022
- Likely scenario: shortages in key sectors such as construction continue into 2023
- Post-pandemic labor dislocation most severe in non-union trade professions
- Increasing wages (below inflation) inadequate to bring back workers into workforce

U.S. Unemployment Federal Reserve Board Central Tendency Projections					
	2021	2022	2023	2024	Longer-run
Unemployment Rate (%)	4.70%	3.80%	3.50%	3.45%	4.25%

Source: Federal Reserve Board (09/2021)



Source: BLS; Chart and analysis: Indeed Hiring Lab

Political Risk

Roadmap 2022-2025

Trifecta of hot, cold, and cyber wars most clear and present danger to U.S. political and economic stability since the fall of the Berlin Wall

U.S. Risk Drivers

- ▲ Labor dislocation and “K” recovery
- ▲ Midterm Elections and institutional deadlock
- ▲ Worsening socioeconomic inequality
- ▲ Far-right domestic radicalization and terrorism
- ▲ Anti-“vax” radicalization and virus spread
- ▲ Far-left fossil fuel-directed industrial sabotage

Global Hot Spots

- ▲ Taiwan, Hong Kong, Ladakh, North Korea
- ▲ Ukraine, Belarus, and Latvia
- ▲ India, China, and Pakistan
- ▲ Weaponized trade policy
- ▲ State-sponsored cyber terrorism and warfare
- ▲ State and non-state actor election interference

Inflation Forecasts

Roadmap 2022-2025

Specific goods' ability to overcome supply chain delays, labor disruptions, and demand imbalances will determine time required to return to pre-pandemic CPI trends

Additional, some goods will experience additional price pressure due to structural changes in expenditures

Inflation: Return to Trend Obstacles & Forecasts								
Key CPI Component	CPI 2019-21 (Yo2Y%)	Return to Trend Obstacles			CPI Forecasts (YoY%)			
		Supply Chain	Labor	Demand	2022	2023	2024	2025
Food	6.5%	•	•	•	5.5%	4.5%	3.5%	2.6%
Housing	5.4%	•	•	•	4.6%	3.8%	3.0%	2.3%
Construction	17.7%	•	•	•	14.0%	10.2%	6.5%	2.8%
Durables	11.6%	•	•	•	8.9%	6.3%	3.6%	1.0%
Used Vehicles	30.6%		•	•	23.2%	15.8%	8.5%	1.1%
All Urban	6.0%				5.1%	4.1%	3.2%	2.3%
Gas, All Types	16.2%	•		•	11.5%	6.8%	2.1%	
New Vehicles	6.4%		•	•	3.6%	0.8%		
Medical	3.7%	•		•	4.1%	4.5%		
Apparel	-2.4%		•	•	-0.7%	1.00%		
Transportation	10.0%			•	8.3%	1.7%		
Electricity	4.9%			•	1.0%			

Return to Trend
Average
4 Years
3 years
2 years
1 year

Source: Data FRED; Table, analysis and forecasts: Triple-I

Replacement Costs Forecasts

Roadmap 2022-2025

We expect insurance replacement costs will take longer to return to pre-pandemic trends than overall inflation

This is partly due to replacement costs having increased over the duration of the pandemic an average of 11.75% versus 6% for overall inflation

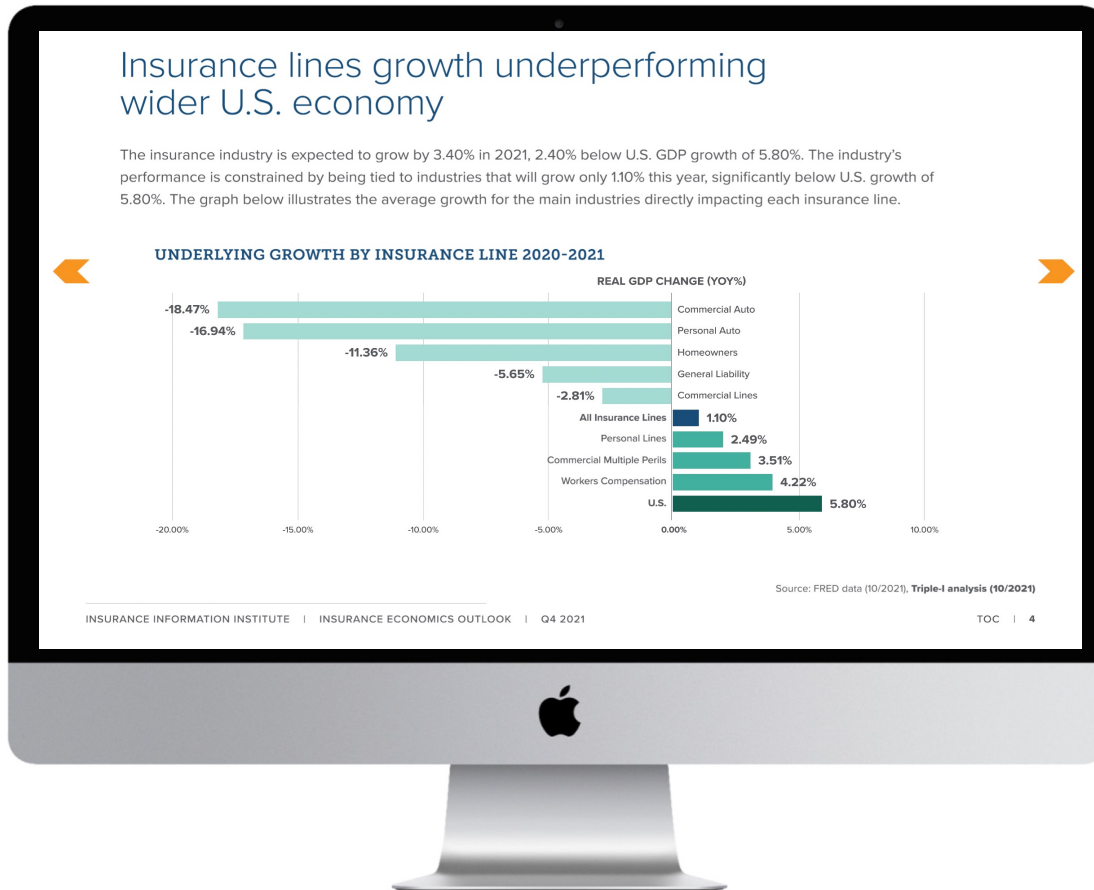
Over the next 12 months, Triple-I will focus on increasing forecasting accuracy

Insurance Replacement Costs: Return to Trend Obstacles & Forecasts								
Replacement Costs	2020-21 (YoY%)	Return to Trend Obstacles			Replacement Costs Forecasts (YoY%)			
		Supply Chain	Labor	Demand	2022	2023	2024	2025
Homeowners	13.4%	•	•	•	10.6%	7.9%	5.1%	2.3%
Commercial Multi-Perils	21.6%	•	•	•	17.1%	12.6%	8.1%	3.6%
Personal Auto	11.8%	•		•	9.1%	6.4%	3.6%	0.9%
All Lines	11.75%	•	•	•	9.11%	9.11%	9.11%	1.19%
Commercial Auto	11.5%	•		•	6.5%	1.45%	Return to Trend Average 4 Years 3 years 2 years 1 year	
General Liability	1.21%			•	0.03%			
Workers Comp	3.70%			•	2.60%			

Source: Data FRED; Table, analysis and forecasts: Triple-I

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Dr. Michel Léonard, CBE, leads the Triple-I's Economics and Analytics Department and brings more than twenty years of insurance experience including senior and leadership positions. In these roles, he worked closely with underwriters, brokers and risk managers to model risk exposures for property-casualty and specialty lines such as credit, political risk, business interruption and cyber. He is a member of the Insurance Research Council Advisory Board.

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