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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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U.S. Economic Fundamentals and P&C Insurance

P&C Underlying Growth and Replacement Costs

P&C performance constrained by GDP growth and inflation

U.S. and Insurance Growth and Inflation (Change YoY%)

	2016	2017	2018	2019	2020	2021	2022YTD	2022E	2023F	2024F	2025F
Growth											
U.S. GDP	1.67%	2.25%	2.92%	2.29%	-3.40%	5.81%	5.50%	4.00%	2.20%	2.00%	2.00%
P&C Underlying Growth	3.79%	2.59%	3.03%	1.67%	-4.41%	1.10%	0.09%	6.66%	4.56%	3.37%	2.53%
Inflation											
U.S. Inflation (CPI)	1.27%	2.14%	2.43%	1.81%	1.25%	4.68%	5.20%	2.60%	2.30%	2.10%	2.10%
P&C Replacement Costs	0.11%	0.34%	1.55%	1.20%	1.35%	11.75%	16.32%	9.91%	6.74%	3.84%	2.50%

Source: U.S. data: FRED; Insurance Data: Triple-I based on FRED

As of 03/01/2022

Replacement Costs represents the average change in CPI for goods impacting P&C replacement costs
Underlying Growth represents the average GDP growth of industries impacting P&C NWP growth.

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Replacement costs increasing faster than U.S. inflation while growth linked to insurance lines slower than U.S. Fundamentals likely to align for peak insurance growth starting Q4 2022

Homeowners Underlying Growth and Inflation

Below average completion rates and above average commodity and labor costs constrained performance in 2021 – all expected to continue into 2022

Homeowners	2016	2017	2018	2019	2020	2021
Market Growth Index	**7.46%**	**6.02%**	**4.10%**	**4.39%**	**0.29%**	**5.35%**
Housing Units Completed	10.4%	8.9%	3.6%	6.1%	2.4%	5.0%
All Employees Residential Buildings	5.3%	3.0%	6.0%	2.8%	-0.8%	7.7%
Retail Trade	3.7%	3.3%	3.2%	2.5%	-2.9%	3.7%
Replacement Cost Basket	**0.61%**	**1.77%**	**3.05%**	**1.52%**	**1.76%**	**11.14%**
Shelter	3.4%	3.3%	3.3%	3.4%	2.5%	2.7%
Household Furnishing & Supplies	-1.7%	-1.7%	-0.5%	1.1%	1.3%	4.0%
Construction Materials	0.2%	3.6%	6.4%	0.0%	1.5%	26.7%

Market Growth represents the average growth of GDP components impacting individual lines' NWP growth.

Replacement Cost Basket represents the average change in CPI for goods impacting replacement costs for individual line.

Source: FRED data; Analysis: Triple-I.

As of 02/2022

Personal Auto Underlying Growth and Inflation

Low inventory and high labor costs constrained performance in 2021 – inventory expected to recover in 2022 while labor costs likely to remain elevated longer

Personal Auto	2016	2017	2018	2019	2020	2021
Market Growth Index	**-2.76%**	**2.70%**	**-0.34%**	**2.58%**	**-8.68%**	**8.49%**
Auto & Light Trucks Sales	0.5%	-1.9%	0.5%	-1.5%	-14.7%	12.9%
Average Expenditures on Autos, All Units, Consumers	-9.08%	11.56%	-1.95%	10.54%	2.94%	
Replacement Cost Basket	**-1.74%**	**-0.21%**	**-0.60%**	**0.09%**	**1.11%**	**13.07%**
New Vehicles	0.2%	-0.2%	-0.5%	0.4%	0.5%	5.8%
Used Vehicles	-2.6%	-3.6%	0.1%	1.0%	3.2%	26.5%
Parts & Equipment	-2.8%	3.2%	-1.4%	-1.1%	-0.4%	6.9%

Market Growth represents the average growth of GDP components impacting individual lines' NWP growth.

Replacement Cost Basket represents the average change in CPI for goods impacting replacement costs for individual line.

Source: FRED data; Analysis: Triple-I.

As of 02/2022

Personal auto sales and expenditures more volatile during pandemic (and economic corrections) than commercial auto's

Commercial Multi-Peril Underlying Growth and Inflation

Labor disruptions and high commodity prices constrained performance in 2021 – disruptions likely to continue but prices to improve in 2022

Commercial Multi-Peril	2016	2017	2018	2019	2020	2021
Market Growth Index	**1.97%**	**2.43%**	**3.41%**	**2.01%**	**-2.24%**	**1.94%**
Real Estate, Rental & leasing	0.7%	1.7%	2.8%	2.1%	-1.3%	2.3%
All Employees Commercial Buildings	4.4%	3.8%	4.5%	1.8%	-4.0%	1.2%
Replacement Cost Basket	**-0.45%**	**0.94%**	**2.48%**	**0.36%**	**0.23%**	**10.83%**
Construction Materials	0.2%	3.6%	6.4%	0.0%	1.5%	26.7%
Equipment & Other Capital Goods	1.6%	1.6%	3.1%	2.1%	0.1%	5.2%
Information Technology Prices	-3.1%	-2.4%	-2.0%	-1.1%	-0.9%	0.6%

Market Growth represents the average growth of GDP components impacting individual lines' NWP growth.

Replacement Cost Basket represents the average change in CPI for goods impacting replacement costs for individual line.

Source: FRED data; Analysis: Triple-I.

As of 02/2022

Commercial construction volume and labor costs less volatile during pandemic (and economic corrections) than homeowners

Commercial Auto Underlying Growth and Inflation

Low inventory and high labor costs constrained performance in 2021 – inventory expected to recover in 2022 while labor costs likely to remain elevated longer

Commercial Auto	2016	2017	2018	2019	2020	2021
Market Growth Index	**1.26%**	**6.80%**	**4.72%**	**5.54%**	**-5.68%**	**9.55%**
Light & Heavy Truck Sales	6.6%	4.4%	8.2%	3.0%	-10.1%	14.5%
Average Expenditures on Autos, All Units	-9.08%	11.56%	-1.95%	10.54%	2.94%	
Replacement Cost Basket	**-1.74%**	**-0.21%**	**-0.60%**	**0.09%**	**1.11%**	**13.07%**
New Vehicles	0.2%	-0.2%	-0.5%	0.4%	0.5%	5.8%
Used Vehicles	-2.6%	-3.6%	0.1%	1.0%	3.2%	26.5%
Parts & Equipment	-2.8%	3.2%	-1.4%	-1.1%	-0.4%	6.9%

Market Growth represents the average growth of GDP components impacting individual lines' NWP growth.

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Source: FRED data; Analysis: Triple-I.

As of 02/2022

Commercial auto sales and expenditures less volatile during pandemic (and economic corrections) than personal auto's

General Liability Underlying Growth and Cost Drivers

Key economic fundamentals improved in 2021 pointing to rising exposure in 2022 – social inflation continues to trump economics as fundamental

General Liability	2016	2017	2018	2019	2020	2021
Market Growth Index	**2.63%**	**0.83%**	**1.57%**	**2.08%**	**0.04%**	**7.19%**
Retail Trade	3.7%	3.3%	3.2%	2.5%	-2.9%	3.7%
Finance & Insurance	1.5%	-1.7%	-0.1%	1.7%	3.0%	10.7%
Replacement Cost Basket	**2.82%**	**2.33%**	**1.65%**	**1.08%**	**1.10%**	**0.99%**
Medical Care Commodities	3.4%	2.8%	1.2%	0.0%	0.5%	-1.6%
All CPI Items Less Food & Energy	2.2%	1.8%	2.1%	2.2%	1.7%	3.6%

Market Growth represents the average growth of GDP components impacting individual lines' NWP growth.

Replacement Cost Basket represents the average change in CPI for goods impacting replacement costs for individual line.

Source: FRED data; Analysis: Triple-I.

As of 02/2022

Workers Compensation Underlying Growth and Exposure Drivers

Payroll and compensation lagged overall growth and constrained performance in 2021 and expected to continue in 2022

Workers Compensation	2016	2017	2018	2019	2020	2021
Payroll	1.78%	1.57%	1.57%	1.35%	-5.72%	2.98%
Total Wages and Salaries	1.42%	1.50%	1.86%	0.96%	-5.41%	4.10%

Source: FRED data; Analysis: Triple-I.

As of 02/2022

The *Great Resignation* and *Great Competition for Talent* narrative is not reflected by compensation that is failing to keep up with inflation – constraining net premium growth.

Inflation Drivers Through Cycles

Inflation Cycles From 1950 to 2022

Six statistically significant inflation cycles from 1950 to 2022

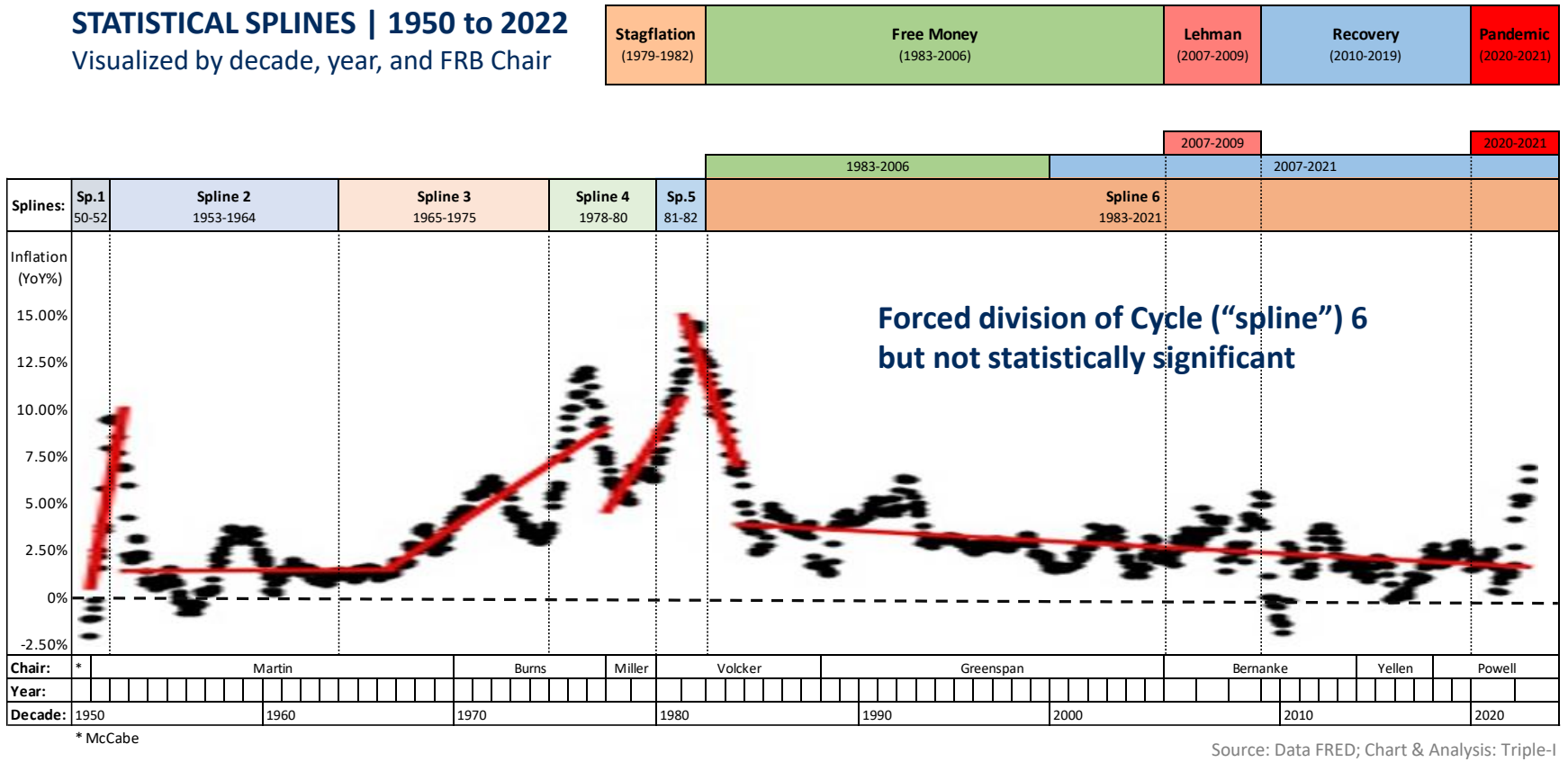
We divided inflation periods post-1978 as follows:

- 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



* McCabe

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

U.S. Inflation During Pandemic Not Level of Oil Crisis

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

U.S. Inflation Patterns Little Changed From 1983 to 2019

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%	2.6%
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%	3.2%
4	Housing	2.7%	
5	Construction	2.3%	
	All Urban	**2.1%**	
6	Gas, All Types	1.5%	
7	Apparel	0.2%	
8	Transportation	0.2%	-0.5%
9	New Vehicles	-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%	2.4%
4	Construction	2.1%	
5	Food	1.8%	
	All Urban	**1.8%**	
6	Transportation	1.7%	
7	Used Vehicles	1.1%	
8	Electricity	1.0%	0.7%
9	New Vehicles	0.8%	
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

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

Insurance Replacement Costs Increases Comparable to 1980s' Inflation

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 4.69% (revised to 5.2%)

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%	
2	Gas, All Types	11.0%	11.5%
3	Construction	8.7%	
4	Durables	5.7%	
5	Transportation	5.3%	4.3%
6	New Vehicles	3.2%	
7	Food	3.2%	
	All Urban	**3.0%**	
8	Housing	2.7%	
9	Electricity	2.4%	1.5%
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%	
2	Gas, All Types	16.2%	21.5%
3	Construction	17.7%	
4	Durables	11.6%	
5	Transportation	10.0%	8.6%
6	New Vehicles	6.4%	
7	Food	6.5%	
	All Urban	**6.0%**	
8	Housing	5.4%	
9	Electricity	4.9%	2.9%
10	Medical	3.7%	
11	Apparel	-2.4%	

CPI Drivers
High
Medium High
Average
Medium Low
Lowest

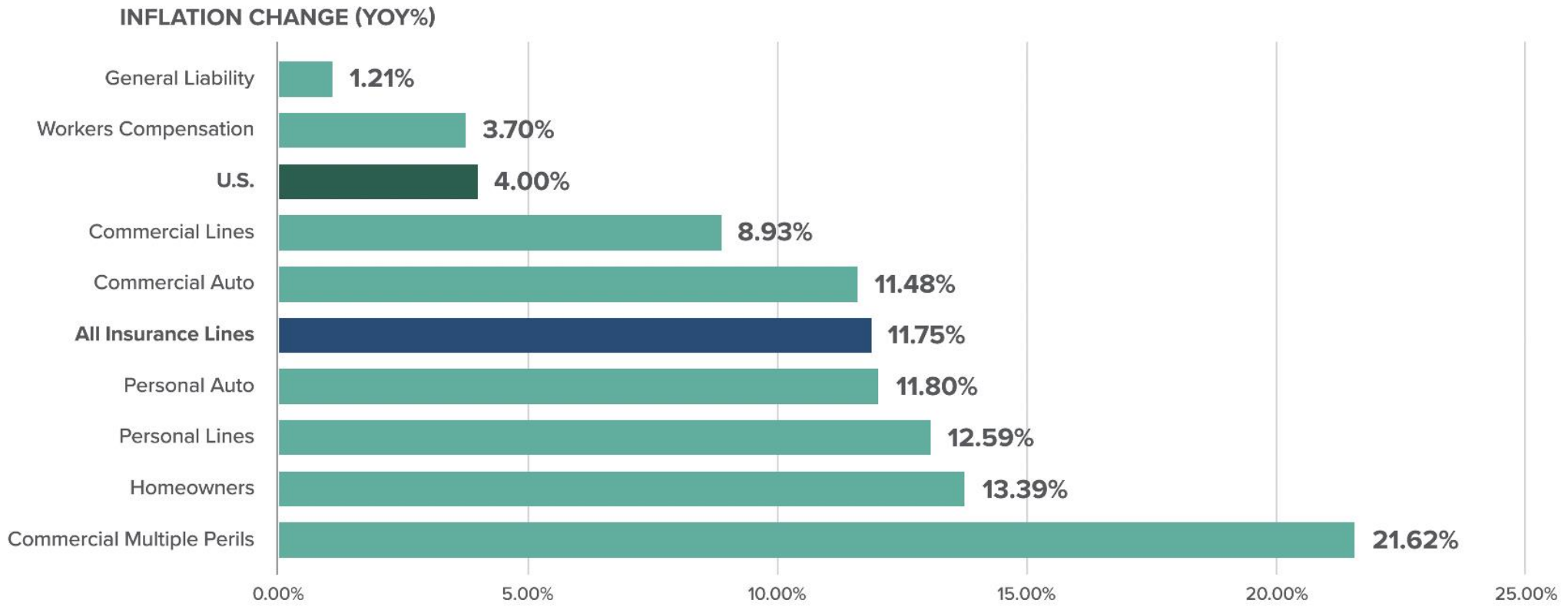
Assigned color and ranking vary slightly across cycles based on CPI distribution

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

Insurance Performance Through Inflation Cycles

Insurance Replacement Costs Across U.S.

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



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

Relationship Between Insurance Replacement Costs and Inflation

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 trough economic cycles?
- Workers Comp CR shows little relationship with economic cycles **>>** Unemployment lag? Lack of wages sensitivity to economic cycles?

NEUTRAL EXPECTATIONS

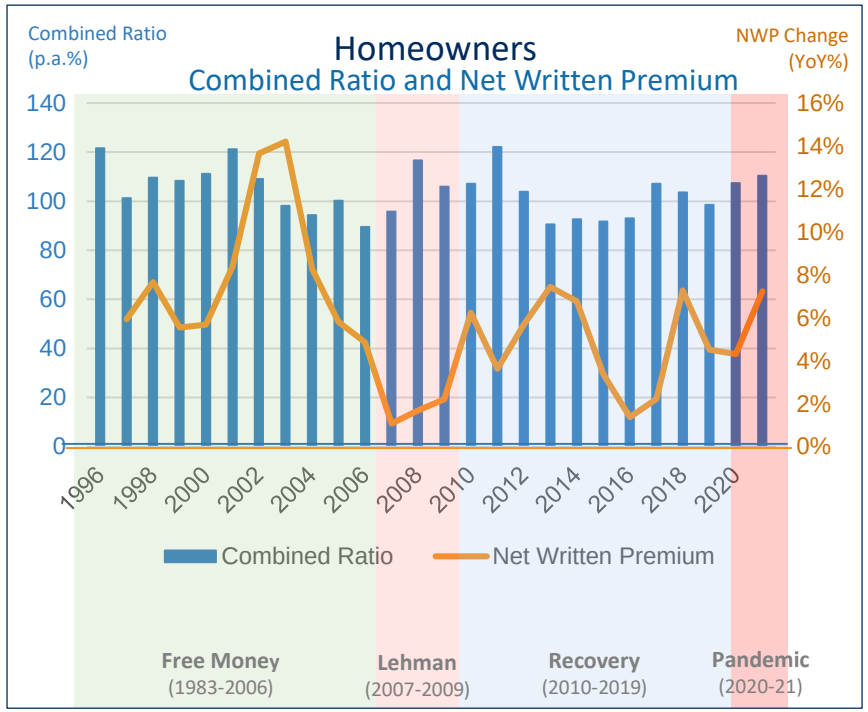
- NWP for commercial auto less vulnerable to economic cycles than personal auto's **>>** longer term expenditures and planning?
- Medical liability CR performance has stronger relationship to economic cycles than underlying costs **>>** underlying price stability due to long-terms contracts?

Homeowners Insurance Performance and Inflation

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

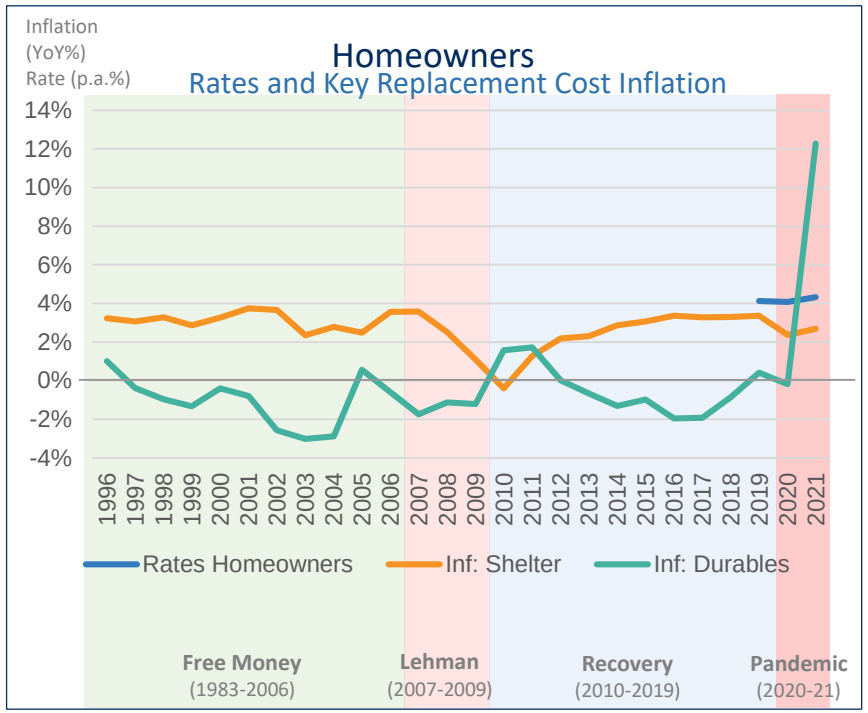
NWP relationship to durables prices stronger than to shelter's *(unexpected)*

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.



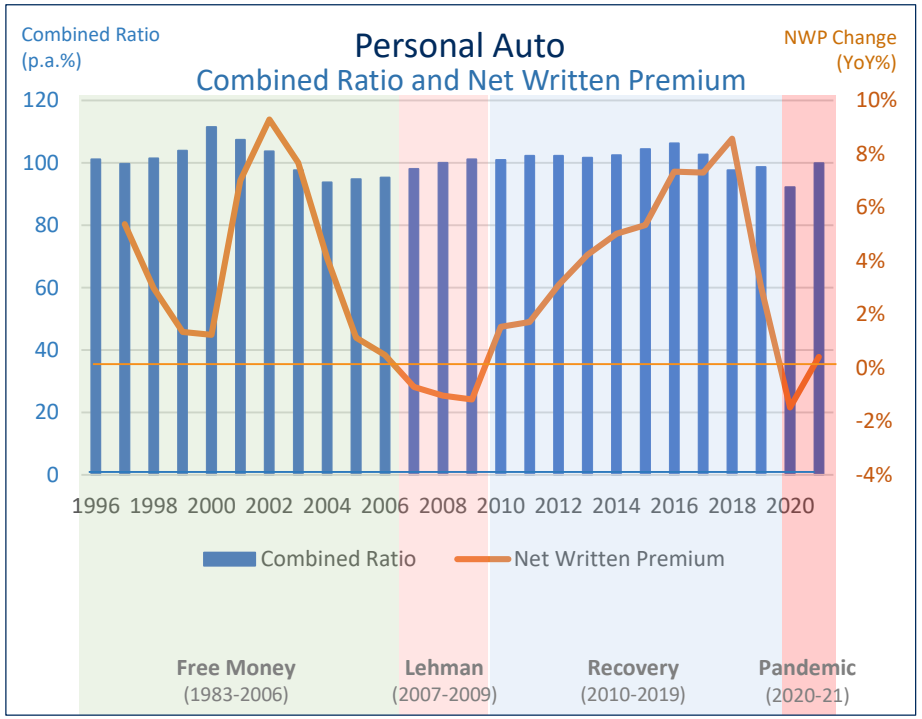
Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

Personal Auto Insurance Performance and Inflation

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)*



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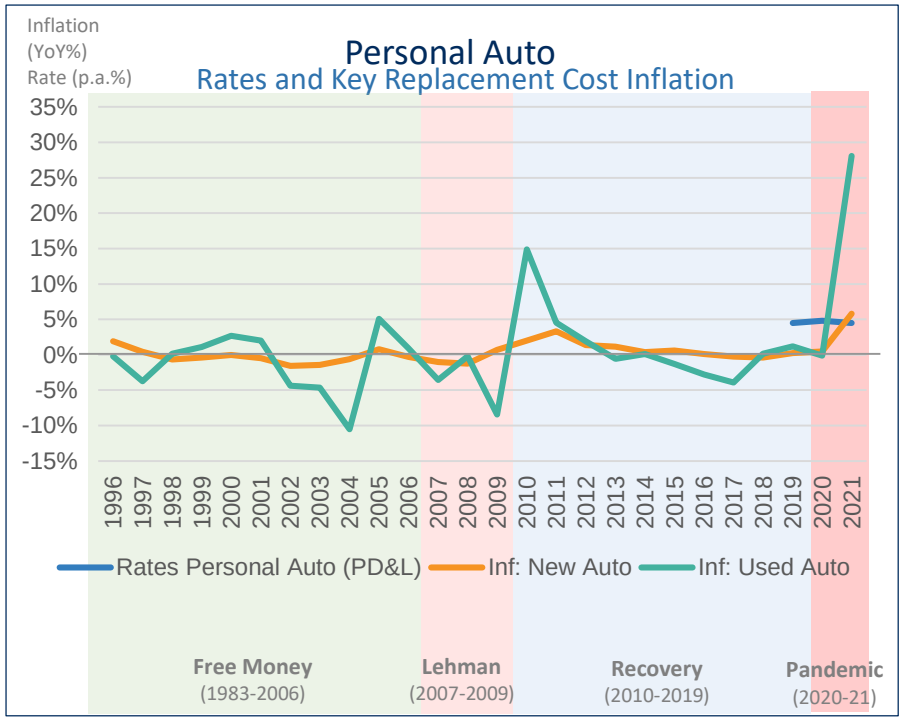


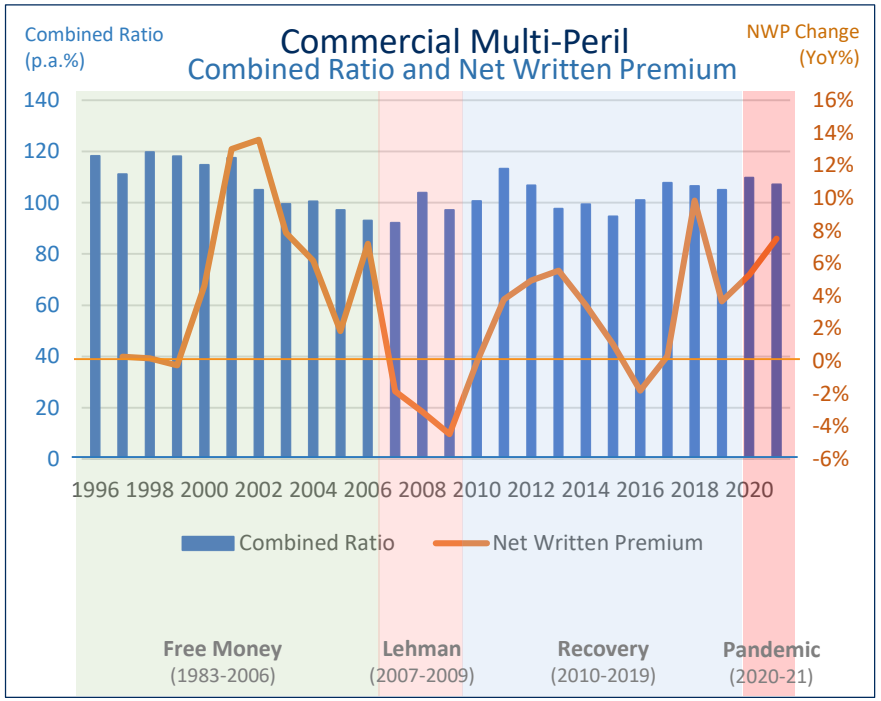
Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

Commercial Multi-Peril Insurance Performance and Inflation

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)



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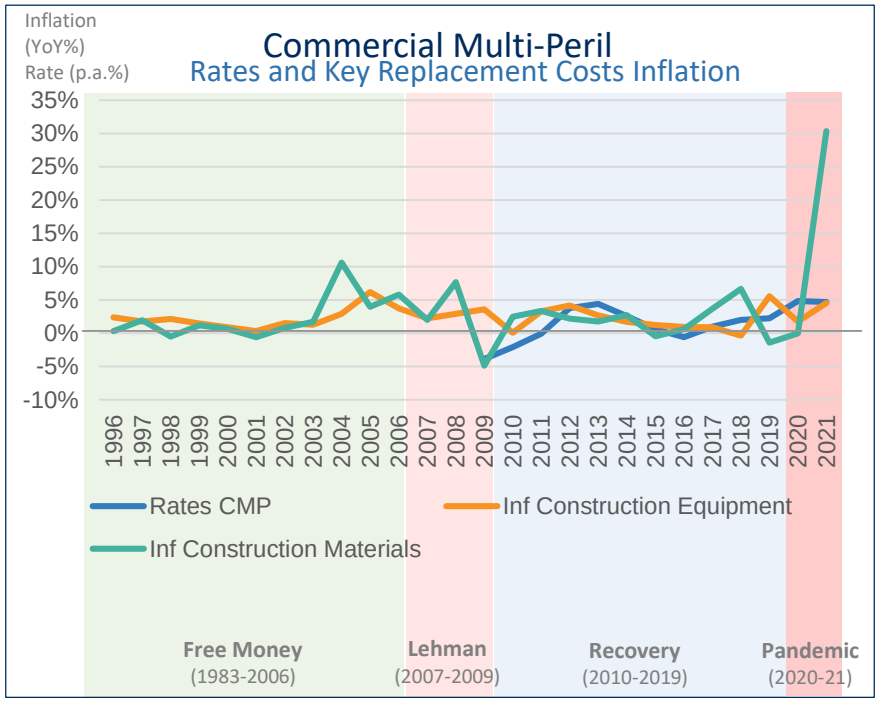


Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

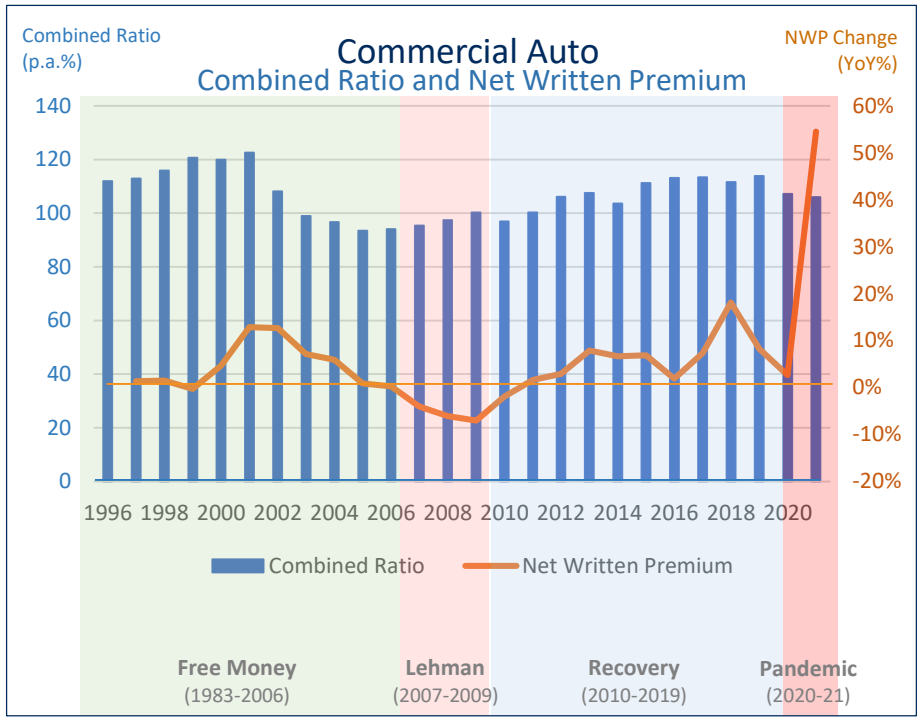
Commercial Auto Insurance Performance and Inflation

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)*

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



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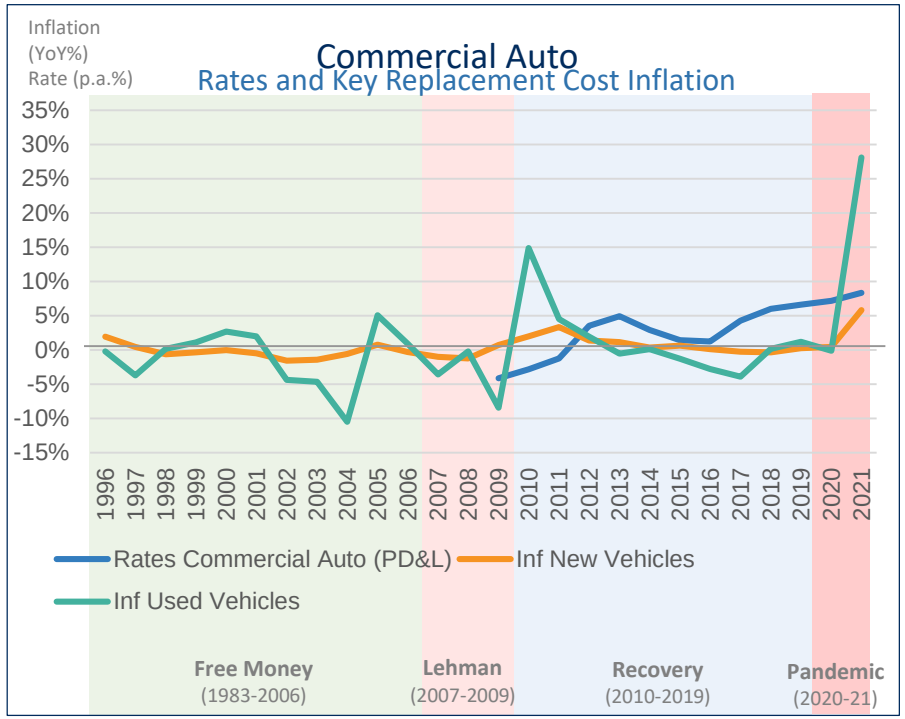


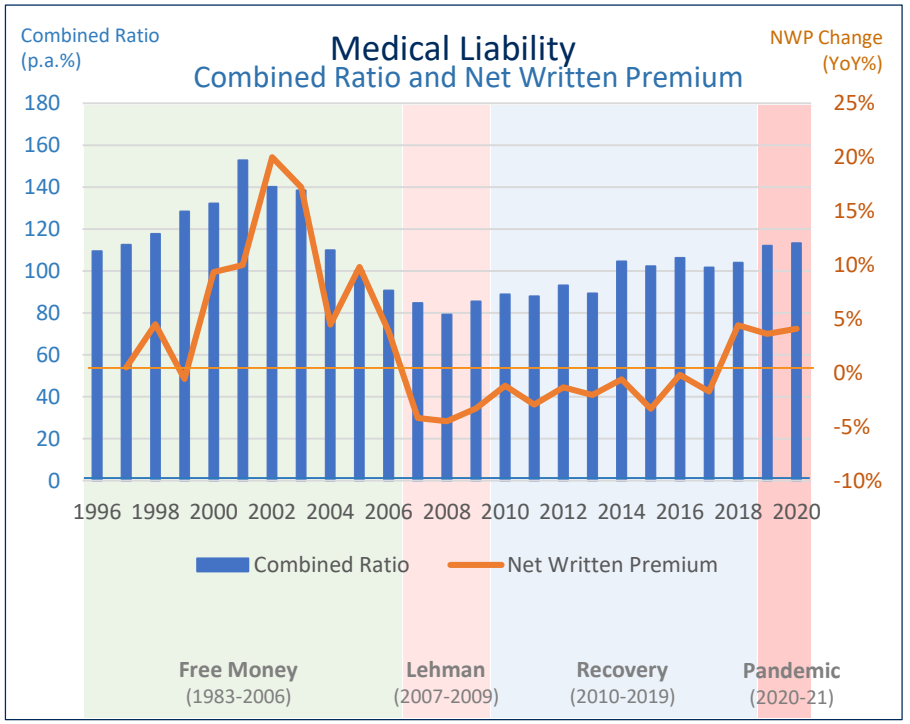
Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

Medical Liability Insurance Performance and Inflation

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)*



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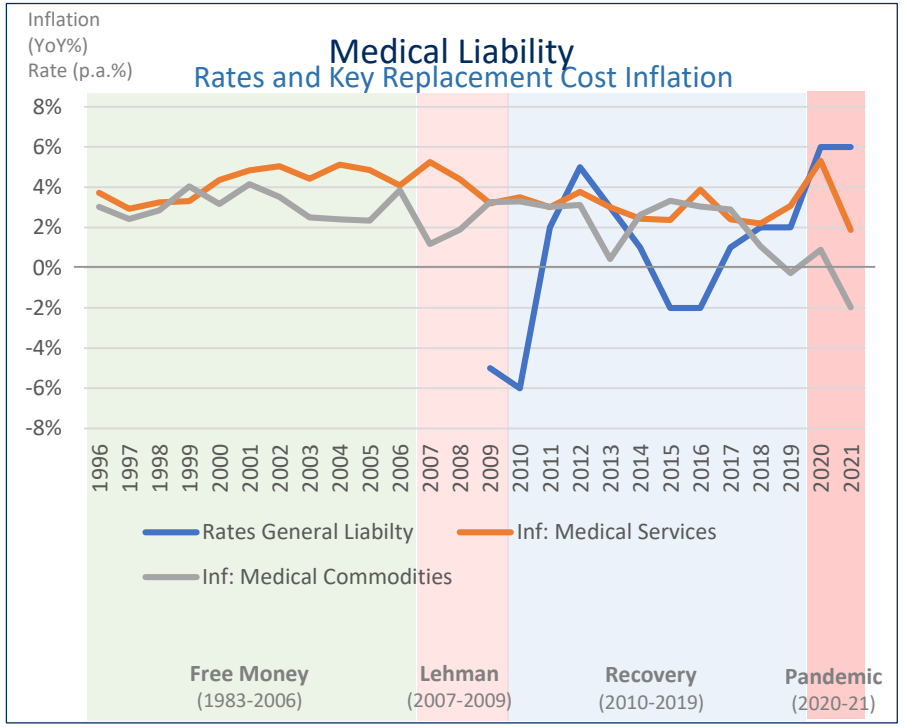


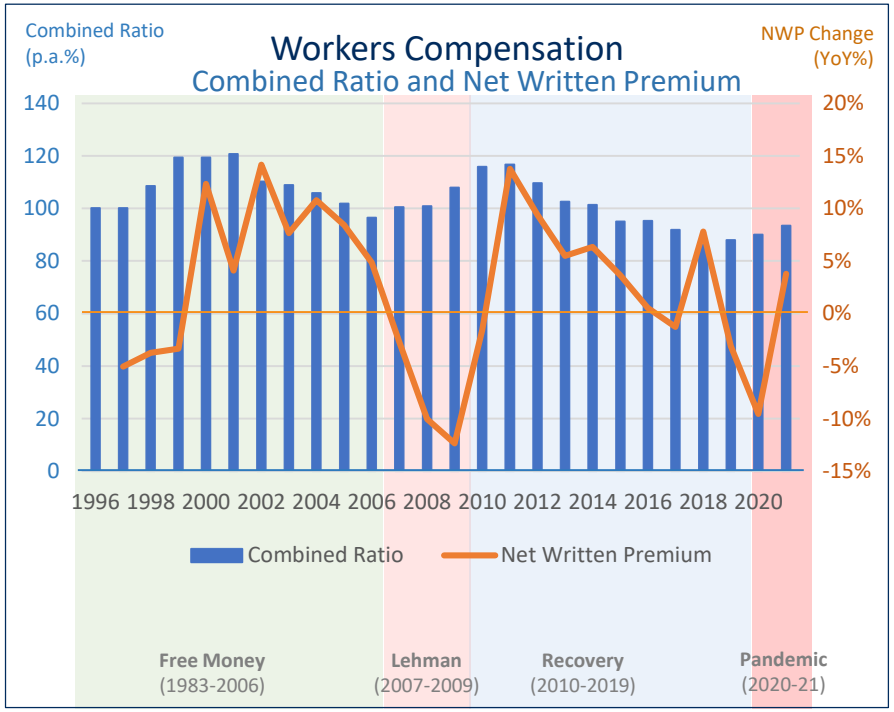
Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

Workers Compensation Insurance Performance and Inflation

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)*



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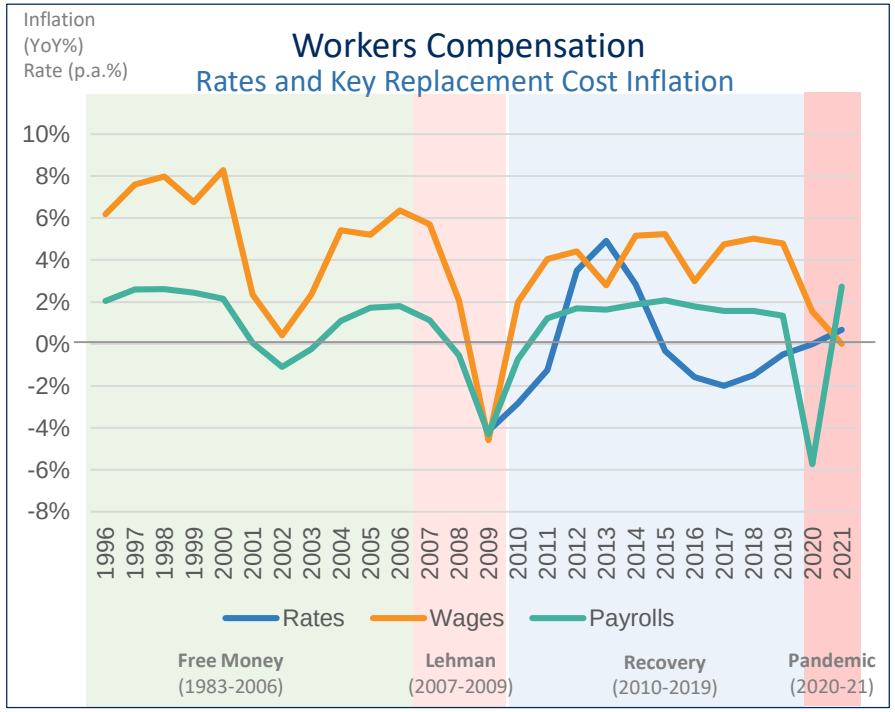


Source: Economic Data FRED NWP & Combined Ratio Data: S&P; Rates Data: Market Scout; Chart & Analysis: Triple-I

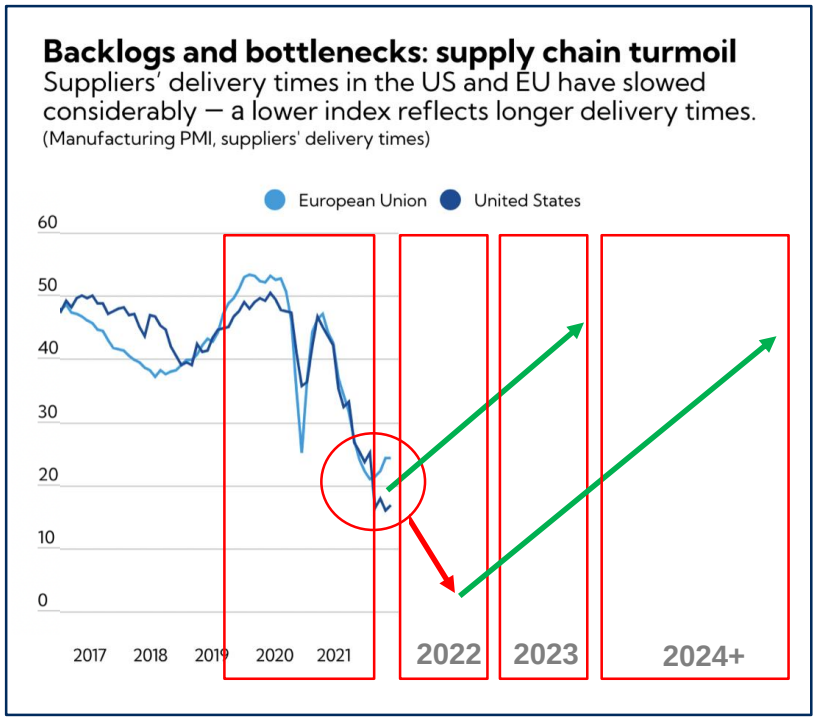
Roadmap to 2022-2025
Inflation and Replacement Costs Forecasts

Replacement Costs Return to Trend Obstacles: Supply Chains

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

Replacement Costs Return to Trend Obstacles: Labor

Lasting structural impact on cost of labor post-pandemic

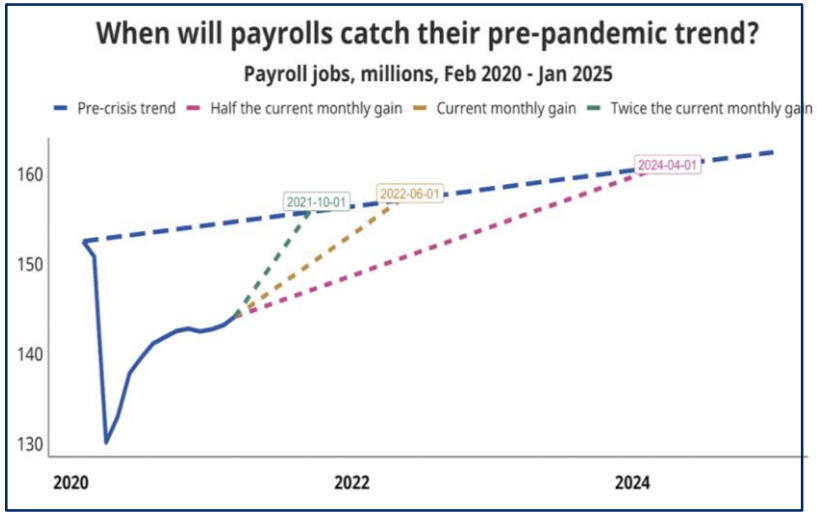
Cost of labor likely to remain significantly elevated into 2024 in residential construction and motor vehicle services

- 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

Replacement Costs Return to Trend Obstacles: Political Risk

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

Replacement Costs Return to Trend Obstacles and Time Line

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			Replacemen t 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%		
General Liability	1.21%			•	0.03%			
Workers Comp	3.70%			•	2.60%			

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

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

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.

Additionally, Dr. Léonard is Adjunct Faculty in the Department of Economics at New York University where he teaches applied economics. Other academic appointment included Adjunct Faculty in the Center for Data Science at New York University, Adjunct Faculty in the Statistics Department at Columbia University and Adjunct Faculty in the Data Science Institute at Columbia University. As both an economist and data scientist, Dr. Leonard's academic work focuses on the applied applications to economics and risk management of quantitative modeling.

Dr. Léonard was the recipient of a Spencer Educational Foundation grant to develop an data science solutions to insurance risk exposure modeling in partnership with the Center for Data Science at New York University. In these capacities, Dr. Léonard act as a liaison between Triple-I's P&C members, thought leaders in academic research in insurance, and regulatory bodies.

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