Market Insights

May 2022

Modelling US inflation

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Frontier has been at the forefront of institutional investment advice in Australia for over 25 years and provides advice on $600 billion of assets across the superannuation, charity, public sector, insurance and university sectors.

Frontier's purpose is to empower our clients to advance prosperity for their beneficiaries through knowledge sharing, customisation, technology solutions and an alignment and focus unconstrained by product or manager conflict.

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Philip has over a decade of senior experience, much of that with the Reserve Bank of Australia (RBA) in both Sydney and New York. Philip has also worked as a consultant to the World Bank in Washington DC and as an Economist at Macquarie Bank. Prior to joining Frontier, Philip was the Economic Advisor to the Treasurer of the Northern Territory. Philip holds a Bachelor of Business from RMIT University along with a Master of Public Administration (MPA) from Columbia University in New York. He is also a CFA Charterholder.

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INTRODUCTION

Modelling US inflation

The outlook for inflation remains a critical aspect of setting investment strategy. In our recent Annual Secular Outlook (released in October 2021), we outlined the range of quantitative tools we have been developing in aiding our analysis for the outlook for inflation. This included a ‘bottom up’ model for Australian inflation.

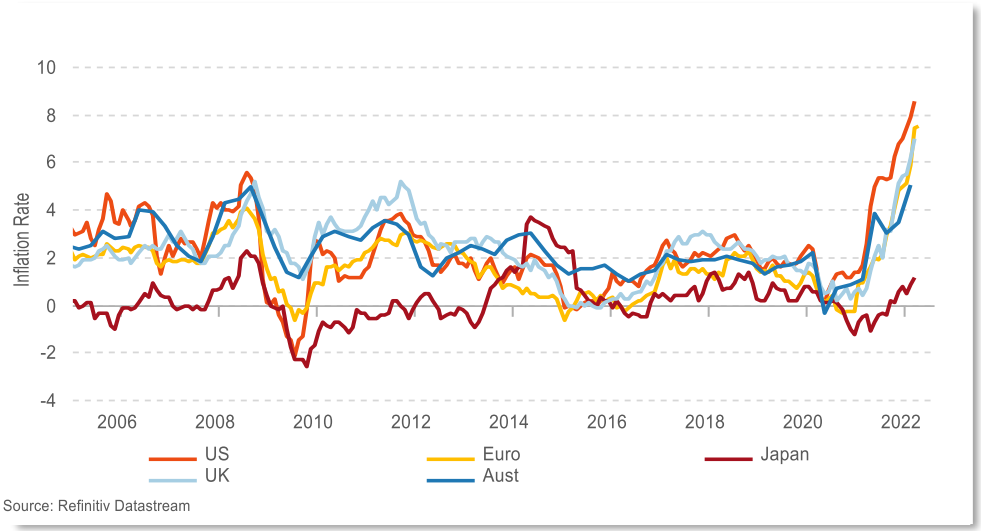
In this paper, we present details for a similar bottom up model we have developed for analysing US inflation. Specifically, we follow methodologies previous employed in academic literature to forecast individual components of the US consumer price index (CPI).

We use the model to project how US CPI may unfold under both a ‘high’ and ‘low’ inflation scenario. Contrary to the current focus in markets, the model suggests that even under a ‘high’ inflation scenario, it is possible we may have reached a peak in the extreme inflation prints in the US. However, the model also puts weight to the argument that inflation may remain ‘sticky’ at an elevated level over the medium-term.

Background

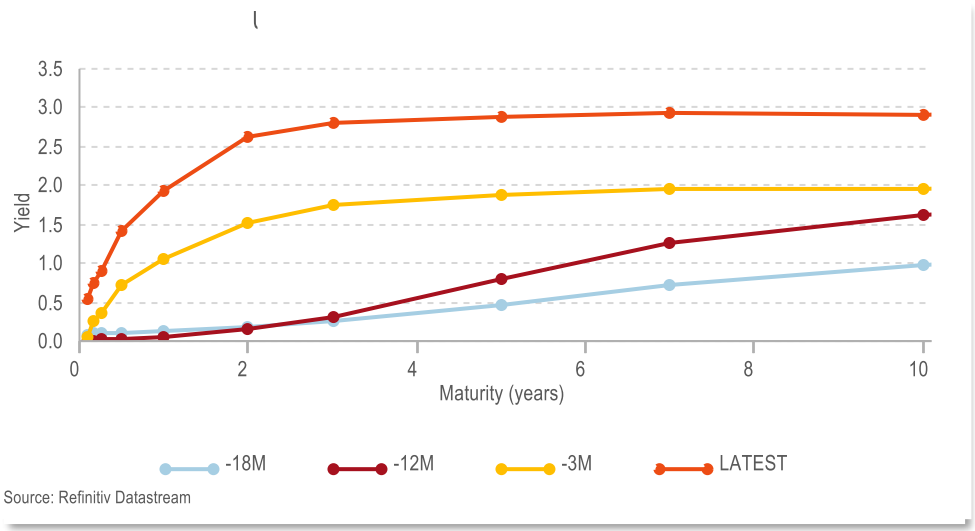
A spike in inflation has caused a large re-pricing in the outlook for future monetary policy tightening

Global headline inflation



Source: Refinitiv Datastream

US treasury yield curve at 11 May 2022 (% p.a.)



Source: Refinitiv Datastream

- Inflation across the world has continued to spike to very elevated levels. Crucially for markets, this has been particularly the case for the US.
- As a result, there has been a significant re-pricing of the outlook for monetary policy tightening which has caused bond markets to sell-off, and contributed to the recent equity market weakness.
- This underscores the importance of analysing and understanding the current and potential future drivers of inflation for asset allocation decisions.

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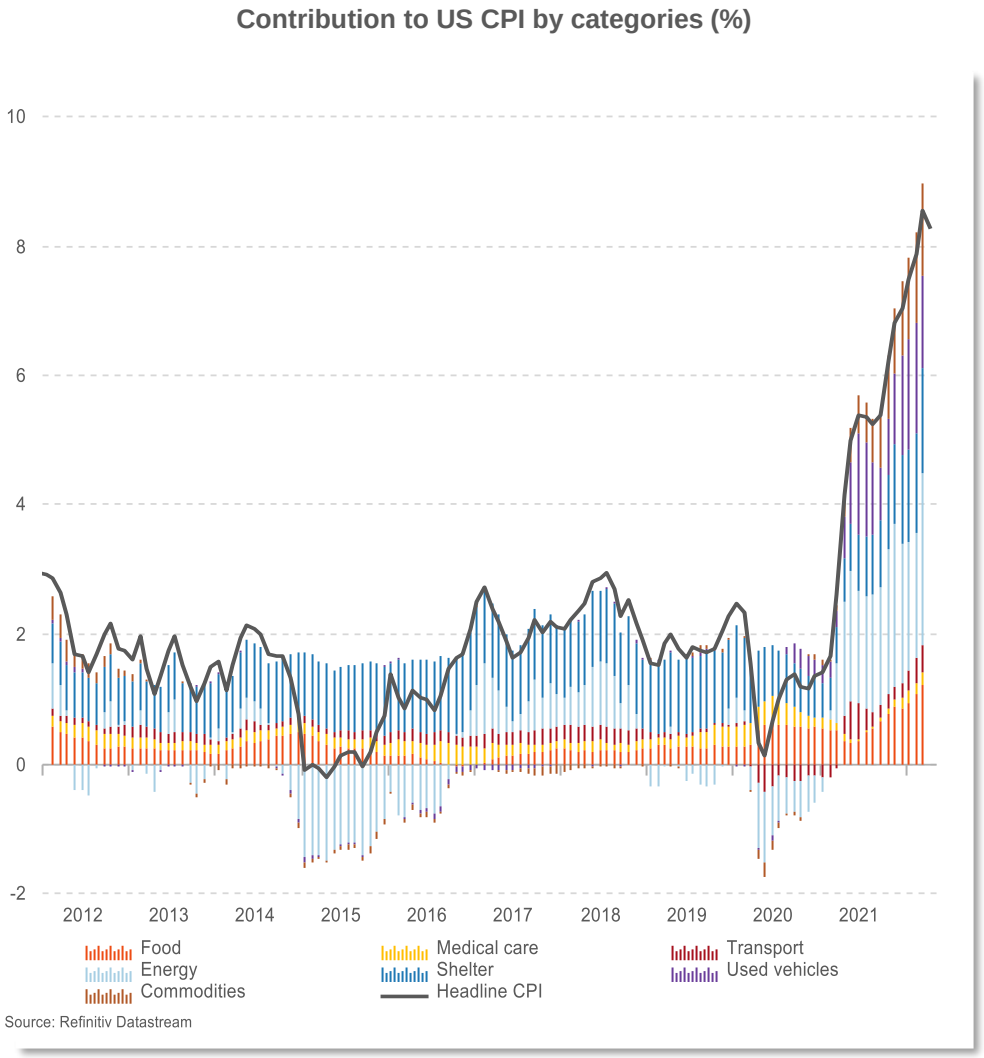
Drivers of the spike in US inflation

Analysing the sub-components of US inflation has been important in understanding the recent spike



Source: Refinitiv Datastream

- The last 12 months have shown having a clear picture of the components of inflation has been important in understanding moves in the aggregate level of the consumer price index (CPI) in the US.
- While many components in US inflation have risen, there have been some particular components that have had a large contribution.
  - Energy has gone from having a disinflationary impulse at the start of the pandemic in 2020 to being a major contributor to the rise in inflation across the last 12 months. This is as a result of the large spike in oil prices, spurred on by Russia's invasion of Ukraine.
  - Vehicles, which typically have a very small impact on overall US inflation, have been an area putting upward pressure on US inflation over the last 12 months. This is linked to global supply-chain disruptions that have persisted since the pandemic.
  - More recently food inflation has been picking up. This is likely partly a result from spillovers in the rise in energy inflation. Energy commodities directly impact the price of production in agriculture through transportation and the cost of fertilisers, which flow through into higher food prices.

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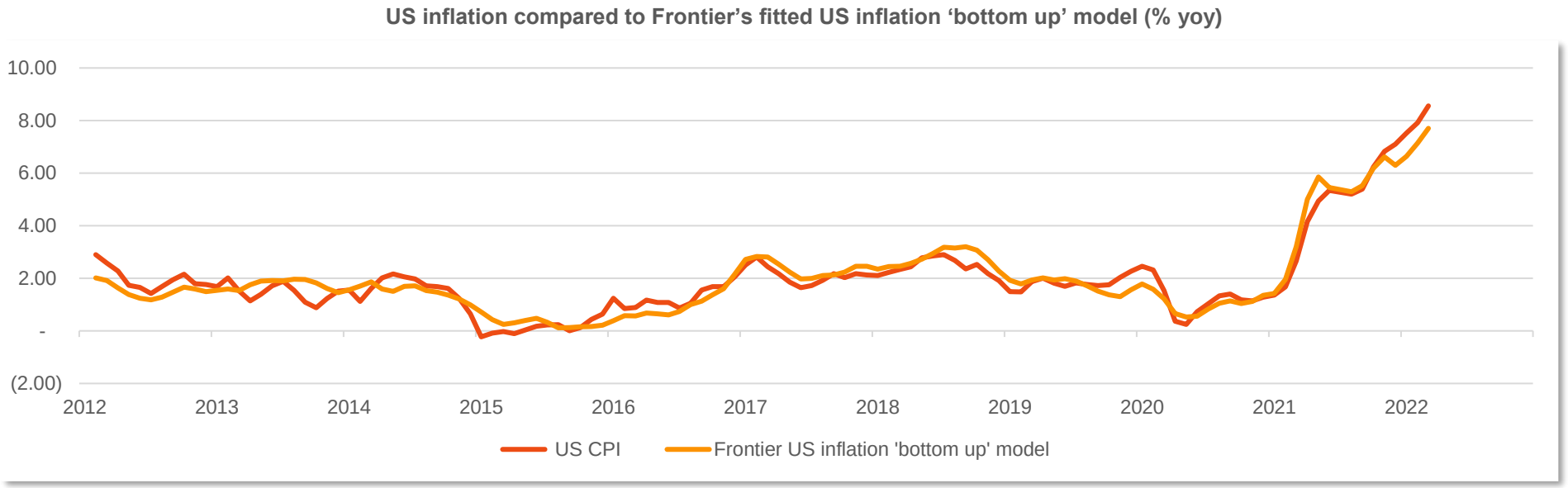
Frontier's US inflation bottom up model

Aggregate picture of US inflation derived from our model focused on individual components of US CPI



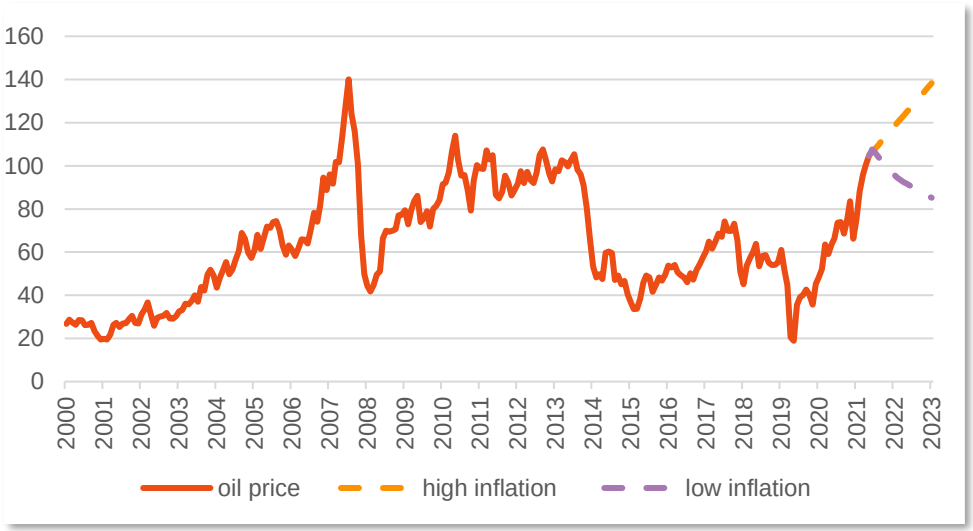
Source: Frontier, Refinitiv Datastream

- Given the importance individual components of US inflation can have on the overall level of US inflation, we have developed an econometric model for estimating each individual component of US CPI. This in turn can be used to analyse overall changes in US inflation.
  - For example, we use a range of indicators, including changes in the oil price, to estimate the expected moves in CPI components like 'energy' and 'transportation service'. Full details of the inputs used for each components are listed in the Appendix.
- While the model is useful and accurate at explaining moves in US inflation, it has limited 'forecasting' ability in and of itself. The model can explain and estimate how changes in aspects (like oil) can impact inflation, but it still relies on forecasts for those major contributors. That is, the model does not 'forecast' the price of oil, but it can explain how potential paths for the future price of oil could flow through into US inflation.
- For that reason, we see the major use of this model being in scenario analysis for understanding how different paths of important macroeconomic variables can flow through into US inflation.

Inflation scenarios

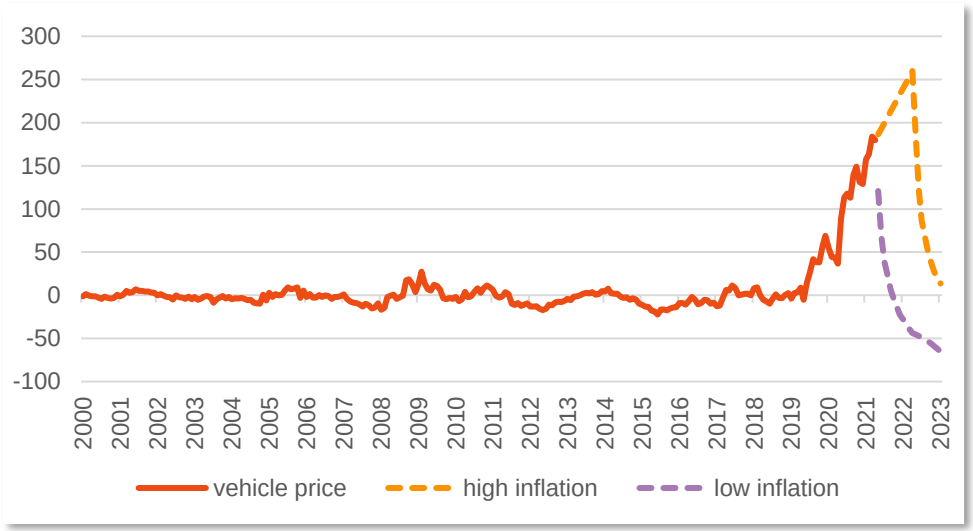
To understand how inflation may unfold we consider both a ‘high’ and ‘low’ inflation scenario

Oil price ($ per barrel)



Source: Frontier, Refinitiv Datastream

New vehicle prices (annual growth rate)



Source: Frontier, Refinitiv Datastream

High inflation scenario:

- Oil price grows to 140 dollars per barrel, which is an historical high level since 2000.
- The annual growth rate of new vehicles prices will first move to the highest prediction point produced by the domestic auto inventory index and then stay at the same level in the following 12 months.
- Unemployment gap moves down 1% more than the forecasted number produced by BLS and Oxford Economics.

Low inflation scenario:

- The oil price is the price indicated by oil futures.
- The new vehicle price index will decrease to its pre-pandemic price level, which is 57.9 at the end of 2019.

For all other components inputs are based on external forecasts (e.g. Federal Reserve, Oxford Economics) or market futures pricing.

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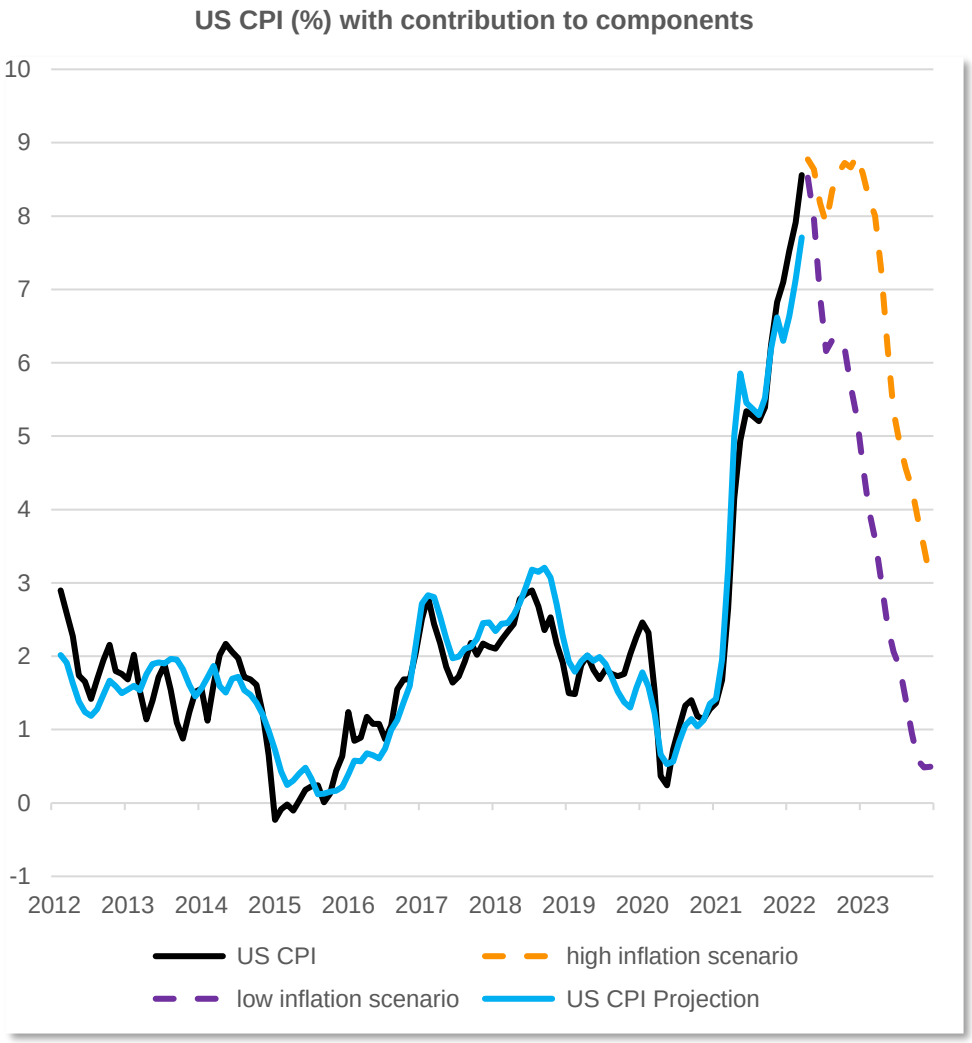
The modelled outlook for US inflation and policy implications

Contrary to current market focus, suggestion inflation readings may reduce from current high levels



Source: Refinitiv Datastream

- While financial markets have become focused on the possibility of continued very high inflation, the outcomes of this bottom up model suggest it is possible that, even under a high inflation scenario, the current readings of very high inflation in the US may have peaked.
- It is possible the inflation outcomes in some areas could be more extreme than in our high inflation scenario.
  - For example, an escalation in military conflict in Eastern Europe could cause an even more rapid increase in commodity prices, or a further tightening in lockdown measures in China to combat COVID-19 could cause a more sustained period of supply chain dislocations.
- However, the model is useful in challenging the status quo in highlighting the possibility the inflation rate in the US may have peaked. That said, the model also does support the conjecture that inflation pressures may persist for a material amount of time. (Under the 'high' inflation scenario, inflation remains uncomfortably high for policy makers for a number of years).
- The implications for policy are somewhat mixed. If inflation rates have peaked it may mean that the pace of monetary policy tightening priced into bond markets may not materialise, i.e. it supports the prospect policy makers will follow a slower path in lifting interest rates than what is currently priced in financial markets. However, the model also does suggest policy makers, like the Fed, will likely still have to follow a tightening path to bring inflation pressures back towards policy targets over the medium term.

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An interactive model of US inflation

During our analysis we have built an interactive web app for considering alternative pathways

- To aid in our ability to make use of this model currently, and in the future, we have built the bottom up inflation model as an interactive web application.
- We have done this for both the US model (presented in this paper) and for Australia (the model that was outlined in our *Annual Secular Outlook*).
- Having a web application of the model ensures we can quickly and easily step through alternative pathways, and understand sources of inflation pressures.

Source: Refinitiv Datastream

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Conclusion

The recent moves in equity and bond markets have been a reminder of the large impact changes in the outlook for inflation, and in turn policy, can have on investors.

This paper presents details of a new bottom up inflation model we have developed for the US, that compliments a range of other tools we employ at Frontier for monitoring and assessing the outlook for inflation.

Critically, using plausible assumptions for how energy and vehicle prices may unfold, this model highlights the possibility the very high levels of inflation readings witnessed in the US may have peaked.

Although this model suggests inflation could be close to peaking, we continue to advocate investors consider other quantitative and qualitative inputs to form a comprehensive view on inflation (see, for example, our Annual Secular Outlook).

However, this model does provide useful insights. It raises the possibility, contrary to the current market focus, that the pace of monetary policy tightening may not be as fast as currently expected.

Want to learn more?

Please reach out to Frontier if you have any questions or visit frontieradvisors.com.au for more information

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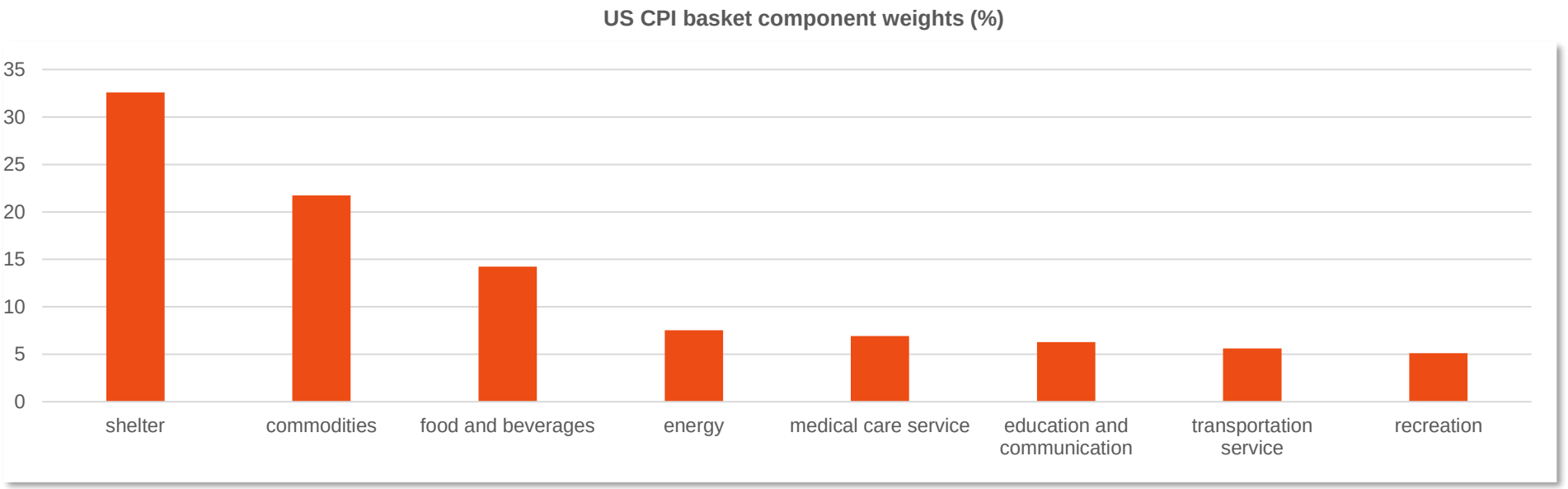
Appendix: US CPI component weights



Source: Refinitiv Datastream

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Appendix: Frontier US inflation 'bottom up' model details

CPI components	Factors	Forecasting equations (2000Dec – 2022Mar)
Shelter	• CPI shelter • Home price • Mortgage rates • Rent • Unemployment gap • Market implied inflation (10yr)	$CPI\_shelter\_Gyoy_t = \alpha_0 + \sum_{i=1}^{12} \alpha_i \times CPI\_shelter\_Gyoy_{t-i} + \sum_{i=0}^{12} \beta_i \times rent\_Gyoy_{t-i} + \sum_{i=0}^{12} \delta_i \times unemployment\_gap_{t-i} + \sum_{i=0}^{12} \rho_i \times market\_implied\_inflation_{t-i} + \sum_{i=0}^{12} \mu_i \times morgate\_rate_{t-i} + \sum_{i=0}^{12} \psi_i \times house\_price\_Gyoy_{t-i}$
Food and beverages	• CPI food and beverages • Wheat price • Imported nonpetroleum commodity price • Live cattle price	$CPI\_Food\_and\_beverages\_Gyoy_t = \alpha_0 + \sum_{i=1}^{12} \alpha_i \times CPI\_food\_and\_beverages\_Gyoy_{t-i} + \sum_{i=0}^{12} \beta_i \times wheat\_Gyoy_{t-i} + \sum_{i=0}^{12} \delta_i \times imported\_nonpetroleum\_commodity\_price\_Gyoy_{t-i} + \sum_{i=0}^{12} \rho_i \times live\_cattle\_Gyoy_{t-i}$
Medical care service	• CPI medical care service • Health employer wage index • Unemployment gap • Market implied inflation (10yr) • Imported nonpetroleum commodity price	$CPI\_Medical\_care\_service\_Gyoy_t = \alpha_0 + \sum_{i=0}^{12} \alpha_i \times CPI\_medical\_care\_service\_Gyoy_{t-i} + \sum_{i=0}^{12} \beta_i \times health\_employer\_wage\_index\_Gyoy_{t-i} + \sum_{i=0}^{12} \delta_i \times unemployment\_gap_{t-i} + \sum_{i=0}^{12} \rho_i \times market\_implied\_inflation_{t-i} + \sum_{i=0}^{12} \mu_i \times imported\_nonpetroleum\_commodity\_price\_Gyoy_{t-i}$
Transportation service	• CPI transportation service • Oil price • Imported nonpetroleum commodity price • Gas price	$CPI\_Transportation\_service\_Gyoy_t = \alpha_0 + \sum_{i=1}^{12} \alpha_i \times CPI\_transport\_service\_Gyoy_{t-i} + \sum_{i\in\{0,2\}} \beta_i \times oil\_price\_Gyoy_{t-i} + \sum_{i=0}^{12} \delta_i \times imported\_nonpetroleum\_commodity\_price\_Gyoy_{t-i} + \sum_{i\in\{0,2,6,8,9,10\}} \rho_i \times gas\_price\_Gyoy_{t-i}$
Education and communication	• CPI education and communication • Unemployment gap • Market implied inflation (10yr) • Imported nonpetroleum commodity price	$CPI\_Education\_and\_communication\_Gyoy_t = \alpha_0 + \alpha_i \times CPI\_education\_and\_communication\_Gyoy_t + \sum_{i=0}^{12} \beta_i \times unemployment\_gap_{t-i} + \sum_{i=0}^{12} \delta_i \times market\_implied\_inflation_{t-i} + \sum_{i=0}^{12} \rho_i \times imported\_nonpetroleum\_commodity\_price\_Gyoy_{t-i}$

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Appendix: Frontier US inflation 'bottom up' model details

CPI components	Factors	Forecasting equations (2000Dec – 2022Mar)
Recreation	• CPI recreation • Disposable income • GDP growth	$CPI\_Recreation\_Gyoy_t = \alpha_0 + \sum_{i=0}^{12} \alpha_i \times CPI\_recreation\_Gyoy_{t-i} + \sum_{i=0}^{12} \beta_i \times disposable\_income\_Gyoy + \sum_{i=0}^{12} \delta_i \times GDP_{t-i}$
Energy	• CPI energy • Oil price • Gas price	$CPI\_Energy\_Gyoy_t = \alpha_0 + \sum_{i=1}^{12} \alpha_i \times CPI\_energy\_Gyoy_{t-i} + \sum_{i=0}^{12} \beta_i \times oil\_price\_Gyoy_{t-i} + \sum_{i \in \{0,1,2,5,7,8\}} \rho_i \times gas\_price\_Gyoy_{t-i}$
Commodities	• CPI commodities less food and energy commodities • New vehicles	$CPI\_Commodities\_less\_food\_and\_energy\_Gyoy_t = \alpha_0 + \sum_{i=1}^{12} \alpha_i \times CPI\_commodities\_less\_food\_and\_energy\_Gyoy_{t-i} + \sum_{i=0}^{12} \beta_i \times new\_vehicles\_Gyoy_{t-i}$

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