

ESTIMATING A NEUTRAL LEVEL FOR CAGED NET JOB CREATION DATA

Gabriel Couto*
macro.brasil@santander.com.br
+5511 3553 8487

- In this report, we seek to estimate a neutral level for CAGED net job creation data, which is the pace of payroll expansion needed in order to stabilize the unemployment rate. We find that, since 2002, the neutral CAGED net job creation level has hovered at around 50-100k per month for most of that time.
- In Brazil, there are two major labor market surveys. The CAGED survey, conducted by the Ministry of Labor, is based on the Ministry's registry of formal hirings and layoffs. The PNAD Household survey, conducted by the IBGE (Brazilian Institute of Geography and Statistics), provides data on both formal and informal workers, as well as the working age population, labor force, and, consequently, the unemployment rate.
- CAGED is useful because it is population data, covering all formal job movements in Brazil (i.e., hiring and layoffs). However, CAGED fails to capture the informal labor market (~45% of all jobs are informal in Brazil). Furthermore, CAGED does not give a precise estimate of the size of the employed population. In addition, CAGED does not provide information on the total unemployed population, making it impossible to estimate the unemployment rate from CAGED data alone.
- PNAD is a sample survey, and population data is estimated based on predetermined parameters. Overall, PNAD is less precise than CAGED in measuring the formal labor market, but it covers a larger share of the population, as it captures informal workers.
- In this context, assessing measures that use aspects of both surveys may be helpful in analyzing the current state of the labor market in greater detail.
- The labor force has already recovered from the pandemic's impact, so we expect it to return to its pre-pandemic growth trend. Furthermore, as we do not expect big structural moves in the formalization rate in the coming years, this should imply relative stabilization of the neutral CAGED level between 80-100k per month — that is, close to 1 million per year.
- In our scenario, the labor market is likely to lose momentum in 2H22 as a consequence of monetary tightening and deceleration in economic activity. We expect this behavior to imply an increase in the unemployment rate, but, as shown by our estimates, in order for this increase to occur, CAGED net job creation results do not necessarily need to go into negative territory — we consider a (seasonally adjusted) rate between 0 and 50k as reasonable and compatible with an increasing unemployment rate, especially from 4Q22 onward.

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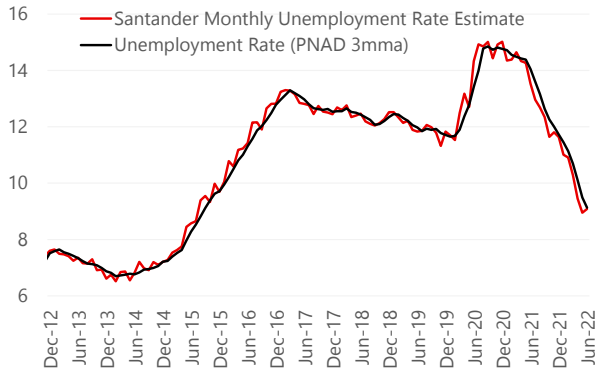
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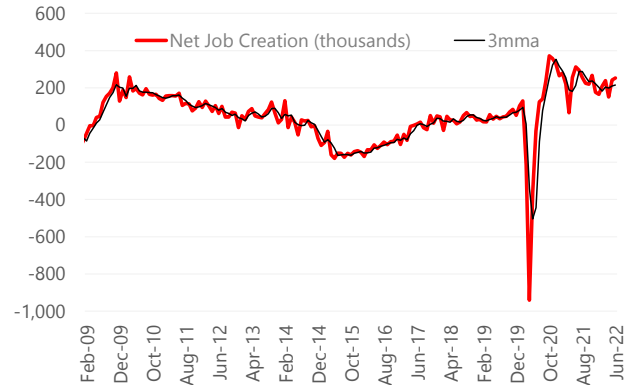
The PNAD Household survey, conducted by the IBGE, provides data on both formal and informal workers, as well as on the working age population, labor force, and, consequently, the unemployment rate. However, PNAD is a sample survey, and population data is estimated based on predetermined parameters. Furthermore, each responding household can only respond the survey up to five times, as the survey is designed to constantly change the sample accounted for. Therefore, although PNAD covers a larger share of the population, it is less precise than CAGED in measuring labor market movements.

Figure 1 – Monthly Unemployment Rate (sa)*



Sources: IBGE, Santander. * All PNAD data is constructed as 3-month moving averages. We estimate the monthly figures based on a Kalman Filter, according to BCB's methodology.

Figure 2 – Net Formal Job Creation (sa)



Sources: CAGED/Ministry of Labor, Santander.

In this context, assessing measures that use aspects of both surveys may be helpful in analyzing the current state of the labor market in greater detail. In this report, we seek to estimate a neutral level for CAGED net job creation data, which is the pace of payroll expansion needed to stabilize the unemployment rate.

Although this measure does not consider the behavior of the informal labor market, it may give an idea of what level of CAGED result will translate into an increasing unemployment rate, especially if our scenario is correct and the labor market decelerates at some point in 2H22 as a consequence of tighter financial conditions and weaker core economic activity.

To define a neutral level for CAGED net job creation data, we first need to define the situation where the unemployment rate remains unchanged through two consecutive periods. For that, the following condition needs to be met.

Figure 3 – Condition for Unchanged Unemployment Rate

$$1 - \left(\frac{E_t}{LF_t} \right) = 1 - \left(\frac{E_{t-1}}{LF_{t-1}} \right)$$

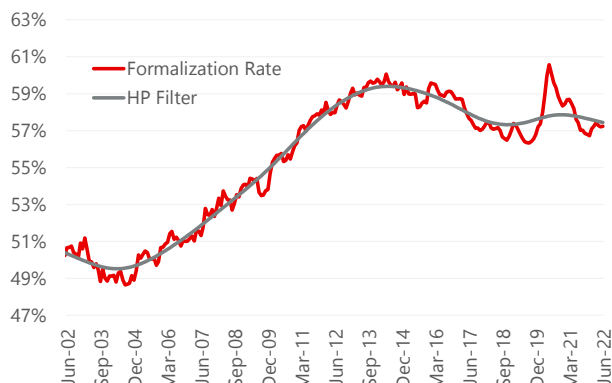
The left- and right-hand sides of the equation pictured in Figure 3 represent the unemployment rate at two given periods, t and $t - 1$, respectively. The variables E_t and LF_t are the total employed population and the labor force at the period t , respectively, as measured by the PNAD survey. We can rewrite the total employed population as $E_t = f_t E_t + (1 - f_t) E_t$, where f_t is the share of formal workers at period t .

To find a neutral level for CAGED net job creation data, we make two assumptions. First, we assume that the short-term variations in the share of formal workers is approximately zero, that is, $f_t - f_{t-1} \approx 0$. This is not equivalent to setting a fixed share of formal workers, as f_t can still change over time, but rather, considers its short-term variations as negligible. Second, we assume that, in the long run, CAGED job creation data is close enough to the variations in formal employment as measured by PNAD, that is, $CAGED_t \approx f_t \Delta E_t$. The charts in Figures 4 and 5 help support these assumptions. In Figure 4, we show that, despite considerable changes over long periods of time, short-term variations in the labor market formalization rate are relatively small. In Figure 5, we show that the long-term behavior of formal job creation is close both the PNAD and CAGED surveys.



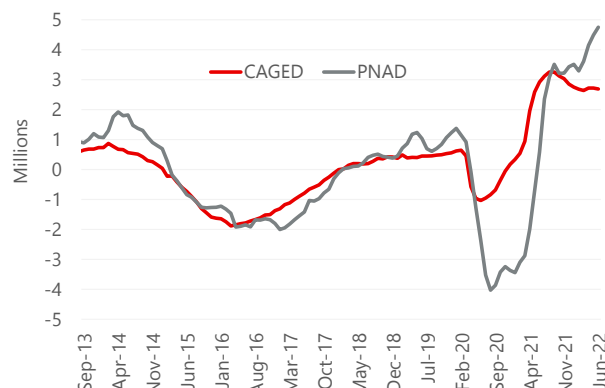
The differences seen during the pandemic, due to methodological issues in both surveys, tend to be temporary and are explored in another one of our special reports¹.

Figure 4 – Share of Formal Workers*



Sources: IBGE, Santander. *For this long series, we interpolated the results of the old PME survey (until 2016) and the new PNAD survey, both conducted by the IBGE.

Figure 5 – Net Formal Job Creation (12-month)



Sources: IBGE, CAGED/Ministry of Labor, Santander.

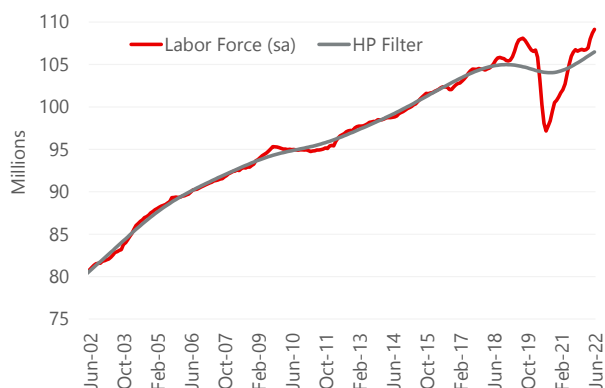
With these assumptions, we can rearrange² the condition of Figure 3 and find the neutral CAGED level, pictured in Figure 6:

Figure 6 – Equation for the Neutral CAGED Net Job Creation

$$CAGED_{t,neutral} = g_{LF,t} f_t E_{t-1}$$

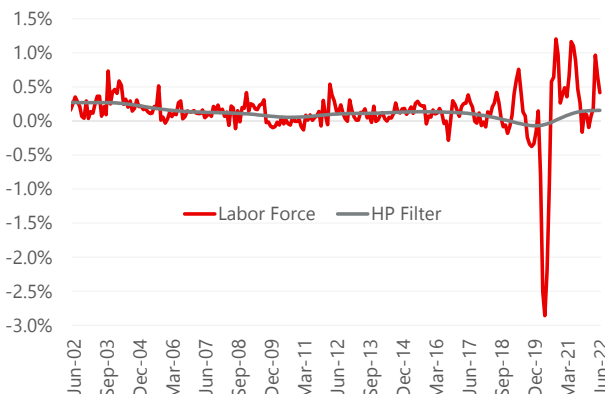
where $g_{LF,t}$ is the growth rate of the labor force at the period t . Note that, as the neutral CAGED level depends on the formalization rate, we do not need to make assumptions on the behavior of the informal labor market. To reduce the volatility caused by short-term variations, we use the Hodrick-Prescott (HP) filtered series for both the labor force growth rate and the share of formal workers in the PNAD survey. Also, since the PNAD survey was launched only in 2012, we interpolate its series with the old PME survey in order to obtain a larger sample and to have a longer time span for the analysis.

Figure 7 – Labor Force (sa)



Sources: IBGE, Santander.

Figure 8 – Labor Force (MoM-sa)



Sources: IBGE, Santander.

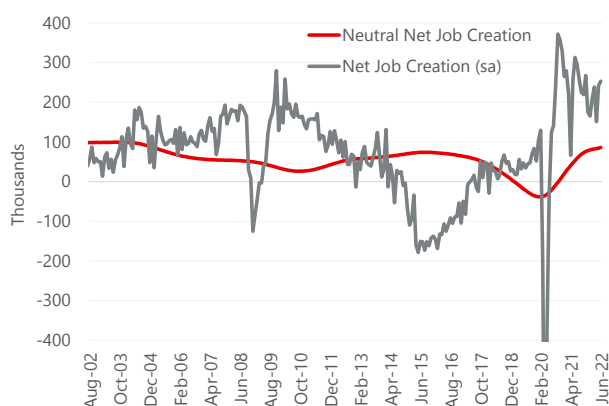
¹ Santander Brazil Labor Market - "CAGED vs. PNAD: Which Labor Survey is Right?" – April 12, 2021 - Available on: <http://bit.ly/STD-pnad-caged-apr21>

² More details on the algebra can be found at the appendix.



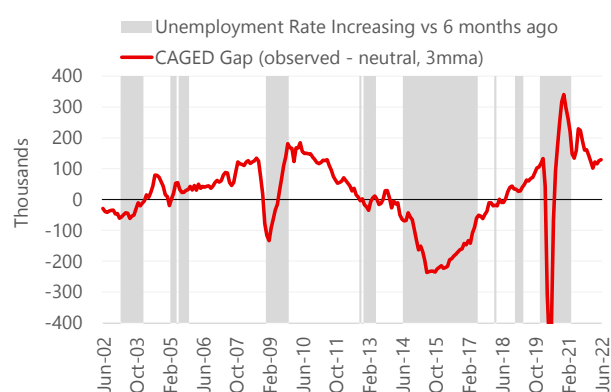
Finally, applying the series obtained from the PNAD survey to the equation pictured in Figure 6 results in our estimate for the CAGED neutral level. At the same time, it is possible to calculate a gap for the CAGED results and to look at their correlation with periods when the unemployment rate is rising.

Figure 9 – Observed CAGED vs. Neutral



Sources: CAGED/Ministry of Labor, Santander.

Figure 10 – Net Formal Job Creation Gap (sa)



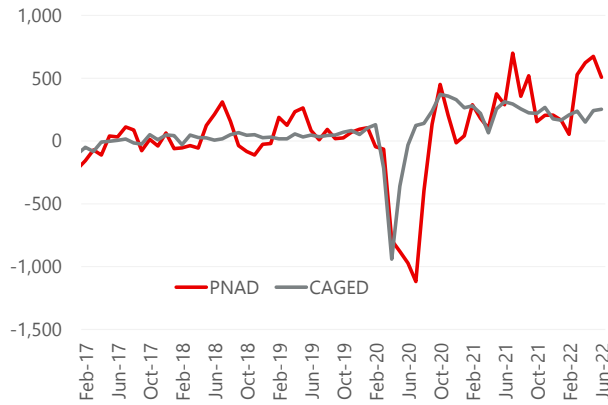
Sources: IBGE, CAGED/Ministry of Labor, Santander.

Note that, since 2002, the neutral CAGED net job creation level has hovered at around 50-100k per month for most of that time. The two exceptions are the period 2009-2010, when the neutral level dropped to around 25k, and the period 2019-2020, when it remained negative as a consequence of the pandemic (and the smoothing of the HP filter). In both periods, the neutral level basically followed the low growth rate of the labor force. In 2009-2010, favorable economic activity conditions allowed young people to postpone their entrance into the labor market, leading to slower growth of the labor force. In 2020, the pandemic and the resulting social distancing measures led a significant share of people who lost their jobs to leave the labor force entirely, at least temporarily. In both cases, slower labor force growth required smaller net job creation in order to stabilize the unemployment rate. Another important point is that periods when the CAGED gap is negative (i.e., CAGED results are below neutral) coincide with periods of an increasing unemployment rate. This shows that our neutral measure fulfills its purpose.

Looking ahead, because the labor force has already recovered from the pandemic's impact, we expect it to return to its pre-pandemic growth trend. As we do not expect big structural moves in the formalization rate in the coming years, this should imply a relative stabilization of the neutral CAGED level between 80-100k per month — that is, close to 1 million per year. In our scenario, the labor market is likely to lose momentum in 2H22 as a consequence of monetary tightening and the deceleration in economic activity, and we expect this behavior to imply an increase in the unemployment rate. However, as shown by our estimates, in order for this increase to occur, CAGED net job creation results do not necessarily need to go into negative territory — we consider a (seasonally adjusted) pace between 0 and 50k as reasonable and compatible with an increasing unemployment rate, especially from 4Q22 onward.

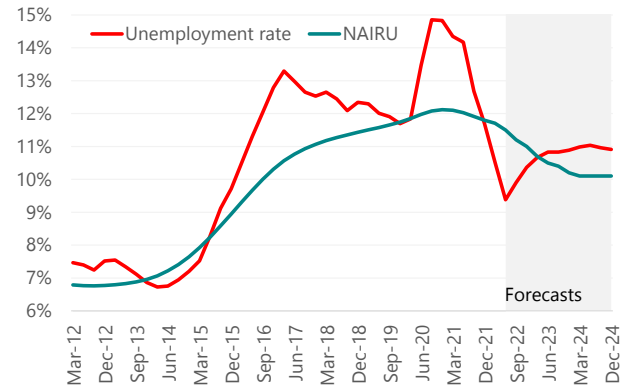


Figure 11 – Net Formal Job Creation (sa)



Sources: IBGE, CAGED/Ministry of Labor, Santander.

Figure 12 – Unemployment Rate Scenario (sa)



Sources: IBGE, Santander.

Appendix: Details on the Algebra to Reach Neutral CAGED Estimate

Rearranging the condition shown in Figure 3, we get:

$$E_t = \frac{LF_t E_{t-1}}{LF_{t-1}}$$

Define the labor force's growth rate as $g_{LF,t} = \frac{LF_t}{LF_{t-1}} - 1$. Then:

$$E_t = (1 + g_{LF,t})E_{t-1}$$

Define $\Delta E_t = E_t - E_{t-1}$. Then:

$$\Delta E_t = g_{LF,t} E_{t-1}$$

Assume $f_t - f_{t-1} \approx 0$ and rewrite $E_t = f_t E_t + (1 - f_t) E_t$. Then:

$$f_t \Delta E_t + (1 - f_t) \Delta E_t = g_{LF,t} E_{t-1}$$

Assume $CAGED_t \approx f_t \Delta E_t$ and rearrange:

$$CAGED_{t,neutral} = g_{LF,t} E_{t-1} - (1 - f_t) \Delta E_t$$

By definition, $\Delta E_t = g_{LF,t} E_{t-1}$. Therefore, we reach the equation for the neutral CAGED:

$$CAGED_{t,neutral} = g_{LF,t} f_t E_{t-1}$$



CONTACTS / IMPORTANT DISCLOSURES

Brazil Macro Research

Ana Paula Vescovi*	Chief Economist	anavescovi@santander.com.br	5511-3553-8567
Mauricio Oreng*	Head of Macro Research	mauricio.oreng@santander.com.br	5511-3553-5404
Jankiel Santos*	Economist – External Sector	jankiel.santos@santander.com.br	5511-3012-5726
Ítalo Franca*	Economist – Fiscal Policy	italo.franca@santander.com.br	5511-3553-5235
Daniel Karp Vasquez*	Economist – Inflation	daniel.karp@santander.com.br	5511-3553-9828
Tomas Urani*	Economist – Global Economics	tomas.urani@santander.com.br	5511-3553-9520
Lucas Maynard*	Economist – Economic Activity	lucas.maynard.da.silva@santander.com.br	5511-3553-7495
Felipe Kotinda*	Economist – Commodities	felipe.kotinda@santander.com.br	5511-3553-8071
Gabriel Couto*	Economist – Special Projects	gabriel.couto@santander.com.br	5511-3553-8487
Fabiana Moreira*	Economist – Credit	fabiana.de.oliveira@santander.com.br	5511-3553-6120
Gilmar Lima*	Economist – Modeling	gilmar.lima@santander.com.br	5511-3553-6327

Global Macro Research

Maciej Reluga*	Head Macro, Rates & FX Strategy – CEE	maciej.reluga@santander.pl	48-22-534-1888
Rodrigo Park*	Economist – Argentina	rpark@santander.com.ar	54-11-4341-1272
Ana Paula Vescovi*	Economist – Brazil	anavescovi@santander.com.br	5511-3553-8567
Juan Pablo Cabrera*	Economist – Chile	jcabrera@santander.cl	562-2320-3778
Guillermo Aboumrad*	Economist – Mexico	gjaboumrad@santander.com.mx	5255-5257-8170
Piotr Bielski*	Economist – Poland	piotr.bielski@santander.pl	48-22-534-1888
Mike Moran	Head of Macro Research, US	mike.moran@santander.us	212-350-3500

Fixed Income Research

Juan Arranz*	Chief Rates & FX Strategist – Argentina	jarranz@santanderrio.com.ar	5411-4341-1065
Mauricio Oreng*	Senior Economist/Strategist – Brazil	mauricio.oreng@santander.com.br	5511-3553-5404
Juan Pablo Cabrera*	Chief Rates & FX Strategist – Chile	jcabrera@santander.cl	562-2320-3778

Equity Research

Miguel Machado*	Head Equity Research Americas	mmachado@santander.com.mx	5255 5269 2228
Alan Alanis*	Head, Mexico	aalanis@santander.com.mx	5552-5269-2103
Andres Soto	Head, Andean	asoto@santander.us	212-407-0976
Walter Chiarvesio*	Head, Argentina	wchiarvesio@santanderrio.com.ar	5411-4341-1564
Mariana Cahen Margulies*	Head, Brazil	mmargulies@santander.com.br	5511-3553-1684
Murilo Riccini*	Head, Chile	murilo.riccini@santander.cl	56 22336 3359

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