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Special Commentary

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The Roar of the Animal Spirits: A New Index

“There’s no good idea that cannot be improved on.” - Michael Eisner

Executive Summary

Major U.S. equity indices are at all-time highs, with the S&P 500 index closing above the 2,700 mark in early January for the first time ever. Whispers that animal spirits are at play are being heard around the markets. Keynes stated that animal spirits are one of the key factors behind fluctuations in the economy and changes in the business cycle. Therefore, a quantitative measure of animal spirits may lead to a more accurate estimation of the potential effect that a change in animal spirits has on the economy. Furthermore, it would be helpful for decision makers to understand the underlying drivers of animal spirits, thus giving them the ability to directly influence animal spirits.

In this report, we introduce a new index to measure animal spirits. In our opinion, instead of relying on a single variable, like the consumer confidence index or S&P 500 index, it would be more informative to construct an index based on several indicators to represent different behaviors across major sectors of the economy. An economy consists of many sectors, and economic agents in those sectors react differently to various policy changes and business cycle phases. For example, the consumer confidence index has increased 173 percent in the post Great Recession era, but personal consumption has increased just 22 percent during the same time period. Similarly, the S&P 500 index has produced one of the largest gains in the current recovery, but the current economic recovery is among the slowest in the post-World War-II era. Therefore, a single indicator may not have the ability to fully capture the animal spirit variable, presenting a need to include information from various major sectors of the economy to construct a more reliable and comprehensive measure of animal spirits.

A single indicator may not have the ability to fully represent the animal spirits.

Our Animal Spirits Index (ASI) includes information from five variables, which are, (1) the S&P 500 index, (2) the Conference Board’s consumer confidence index, (3) the yield spread, (4) the VIX index and (5) the economic policy uncertainty index. These five variables capture actions of major economic agents while representing major sectors, and have the ability to shed light on economic agents’ expectations about the near-term economic outlook. We utilize a dynamic factor modeling (DFM) approach in constructing our index.

Our ASI goes back to January 1967, giving us the opportunity to analyze the index’s behavior during different business cycles and political environments. In analyzing our index, we note key observations that not only set this business cycle apart from prior cycles, but confirm the severity of the Great Recession and the slow recovery that has followed it.

The focus of this report is to present our ASI and its methodology. In the reports to follow, we will estimate the animal spirits’ effect on the economy, while highlighting the key drivers of our ASI.

Historical Perspective: The Good, the Bad and the Ugly of the ASI

Keynes once remarked that animal spirits were one of the key factors behind fluctuations in the economy. More recently, Akerlof and Shiller suggested that human psychology drives financial events worldwide, as seen in the ever-rising home prices of the mid-2000s to plummeting



Human psychology plays an important role in business cycles.

confidence in capital markets in the fallout.¹ Simply put, human psychology plays an important role in business cycles. However, emotional forces cannot be looked at in isolation. Animal spirits as well as monetary and fiscal policy feed off one another. When policymakers step in to restore confidence through either fiscal or monetary policies they often do so with the knowledge that it will likely energize animal spirits. Confident investors are more likely to invest in creating a supply of goods and services that helps drive employment. Likewise, if consumers are hopeful about the future, personal consumption is likely to pick up, which is a major component of GDP.

There are several examples of movements in animal spirits during the 2008-2010 period that demonstrate the effect that animal spirits have on the economy (Figure 1). For example, when the U.S. House of Representatives failed to pass the Troubled Asset Relief Program (TARP) on September 29, 2008, the S&P 500 index dropped more than 8 percent that same day. The S&P 500 index proceeded to drop more than 20 percent the next month, the worst month for the S&P 500 index since April 1932. However, when Secretary of the Treasury, Timothy Geithner, announced a program to buy toxic assets from banks' balance sheets in March 2009, the S&P 500 index gained more than 22 percent during the March-June 2009 period, a sign that confidence was partially restored. Also contributing to the equity rally was that bank stress tests showed that banks did not need to be nationalized as some had feared. Policymakers have a tremendous influence on animal spirits, which in turn can influence the behavior of financial markets.

Figure 1

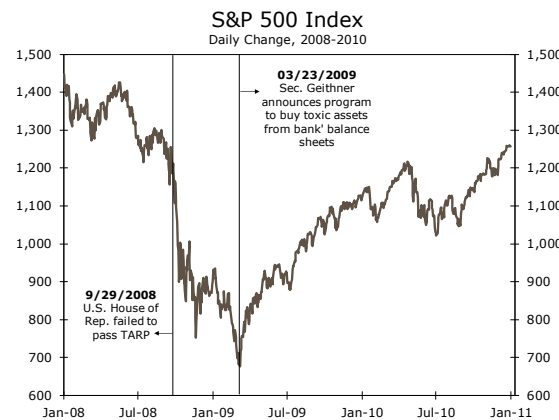
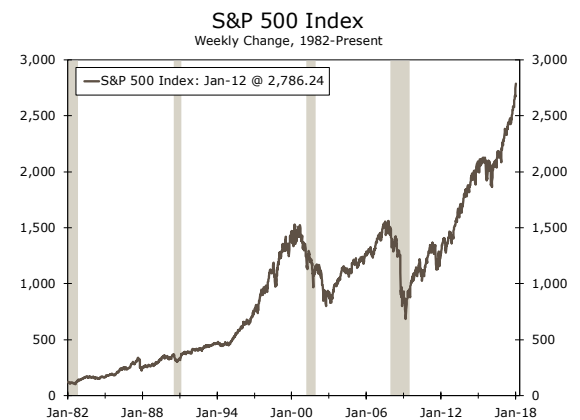


Figure 2



Source: Bloomberg LP and Wells Fargo Securities

Policy makers' decisions, in both the monetary and fiscal space, influence animal spirits.

Monetary policy changes also hold sway over the movement of animal spirits. For instance, on January 22, 2008, the Federal Open Market Committee (FOMC) announced a 75 basis points (bps) cut of the federal funds rate in a surprise announcement (the announcement came in before the opening bell of the U.S. equity markets) to support the U.S. financial markets. A major impetus for this decision was that stocks fell around the world on Monday January 21, 2008 while U.S. markets were closed because of the Martin Luther King Jr. holiday. Following the announcement, the S&P 500 index quickly erased the losses of the previous two days. In a similar decision, the FOMC reduced the federal funds rate 125 bps (to 3.00 percent from 4.25 percent) between December 2007 and January 2008. The immediate effect of the rate cut was less volatility in the U.S. equity markets.

In addition, Akerlof and Shiller suggested that the drop in consumer confidence, and accompanying swoon in animal spirits, was fundamental to the prolonged economic inactivity during the Great Depression.² A restoration of confidence during World War II, and the subsequent economic recovery, indicates that a recovery without rising confidence is highly unlikely.

¹ Akerlof, George A. and Robert J. Shiller. (2009) "Animal Spirits: How Human Psychology Drives the Economy, and Why it Matters for Global Capitalism".

² Ibid.

A Potentially Theoretical Framework of Animal Spirits

In our view, two factors play a key role in the decision-making-process of economic agents: (1) ability and (2) willingness. Ability is a quantitative factor, which consists of monetary aggregation (income, financial asset and loans), while willingness is a qualitative factor, including expectations about the economy, earnings and expected future ability. For example, in the case of a lender, these two factors are essential in making a decision to extend credit; (1) ability to lend and (2) willingness to lend. Where ability to lend indicates how much liquidity or reserve is available for lending, willingness to lend includes expectations about the economy, financial sector, borrowers' reputation and expected future ability to lend.

A lender is more likely to underwrite a loan when he or she is able and willing to lend (lending-decision = willingness + ability). For us, both willingness and ability are important factors in a decision-making process. The willingness factor, however, is more important as it includes the expected ability to lend. A lender may underwrite more (more than her current ability to lend) in a recovery phase because he or she is expecting a higher future ability to lend. Therefore, lenders start lending more, more than their current ability to lend, which may prompt a lending boom. Conversely, in an economic slowdown, the willingness to lend is reduced (confidence is lost) and one may lend less than their existing ability. In a real world example, during the recent financial crisis (2008-2009), lenders refused to lend and the credit market froze. While lenders' ability to lend was reduced due to bankruptcy, lenders who were still solvent and thus had the ability to lend simply lacked the willingness to do so.

A market participant's willingness to make a decision is more important than his or her ability to do so when examining animal spirits.

Lehman Brothers' bankruptcy was one of the major factors that reduced lenders' willingness to lend. For instance, the TED spread jumped to 3.4 percent by October 2008 (the highest since July 1981). The TED spread, or the difference between the interest rates on interbank loans and short-term U.S. government debt, is an indicator of perceived risk in the general economy (Figure 3). A widening TED spread indicates that lenders believe the risk of default on interbank loans (also known as counter-party risk) has increased. Therefore, during the financial crisis, the willingness factor was hit harder than the ability factor. Likewise, U.S. banks' willingness to make consumer loans dropped 47 percent during the recent financial crisis (Figure 4). Essentially, what we are suggesting is that animal spirits affect economic agents' decision-making process through the 'willingness factor' and thus, have the ability to have positive and negative effects on the economy.

Figure 3

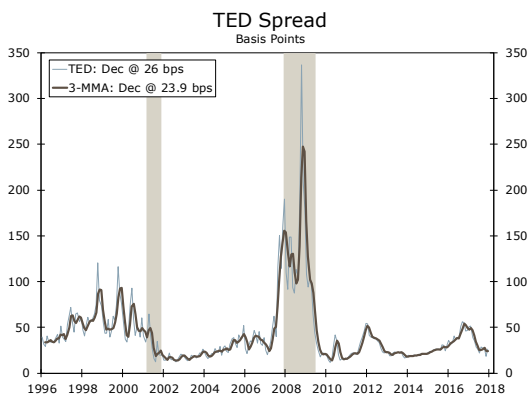
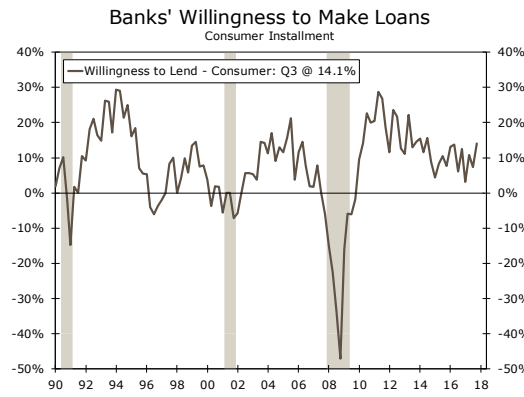


Figure 4



Source: Bloomberg LP, Federal Reserve Board and Wells Fargo Securities

The two-factor approach is also integral in an investor's decision-making-process. For instance, investors make investment decisions based on their ability and willingness to invest. As with the lender example, ability is the quantitative factor and willingness is the qualitative factor. An investor typically invests when he or she is able to and willing to invest. Again, here the willingness factor is the more important one for the same reason previously stated.

The process can also be repeated for consumers in their spending-decision-making process (especially discretionary spending) based on ability and willingness to spend. Therefore,

willingness is an important factor in the decision-making process, causing qualitative fluctuations in a business cycle.

Is the Animal Spirits Effect Different than a Multiplier Effect?

Here, we want to stress the point that the magnitude and speed of the animal spirits effect on the economy is different than that of the multiplier effect. A multiplier effect, for example, boosts aggregate demand more than the initial spending and the increment depends on the magnitude of the marginal propensity to consume (MPC), all else equal. The animal spirits effect, on the other hand, has the potential to change the size of the MPC (people may spend more than the past MPC) and thereby boost aggregate demand more than the multiplier effect (as the multiplier effect depends on the past MPC size). Basically, a multiplier effect may only boost the economy according to some past quantitative averages, while the animal spirits may boost the economy beyond those past averages and also influence the economic agent's behavior. Again, this phenomenon occurs via the willingness factor. In other words, a multiplier effect boosts the economy but may not change the behavior of economic agents, while shifts in animal spirits may do both.

Another difference between the animal spirit effect and a multiplier effect is the speed of adjustment. A change in animal spirits produces a sudden effect (in line with a shock), which creates a swift change in the willingness factor. That sudden change can be seen in swift reactions of the S&P 500 index or in changes to personal spending, as witnessed during the Great Recession. The multiplier effect usually works via the ability factor and thereby is slower than the animal spirit effect. In sum, animal spirits work through the willingness factor and the speed and size of the potential effect is faster and larger than the traditional multiplier effect, which works through the ability factor.

A New Animal Spirits Index: A Dynamic Factor Modeling Approach³

As mentioned earlier, Keynes coined the term "animal spirits" in 1936 and since then many studies have attempted to quantify it and its effect on the economy. Most studies have utilized measures of consumer confidence (some studies have employed the S&P 500 index) as a proxy for animal spirits.⁴

In our opinion, instead of using a single variable like the consumer confidence index, or the S&P 500 index, it would be more informative to construct an index based on several indicators. Including multiple indicators allows us to represent economic agents of major sectors to quantify an accurate measure of animal spirits. That is, as an economy consists of many major sectors, and economic agents in those sectors react differently to different policy changes and business cycle phases, it is necessary to measure many indicators in quantifying animal spirits. For example, the consumer confidence index has increased 173 percent in the post Great Recession era, but personal consumption increased only 22 percent during the same time period. Similarly, the S&P 500 has produced one of the largest gains in the current recovery/expansion, but the current economic recovery is among the slowest in the post-World War-II era. Therefore, a single indicator may not have the ability to fully represent animal spirits, leading to the need to include information from various major sectors of the economy to construct a more reliable and comprehensive measure of animal spirits.

We constructed a comprehensive index to quantify animal spirits, which includes information from five variables which are, (1) the S&P 500 index, (2) the Conference Board's consumer confidence index, (3) the yield spread, (4) the VIX index and (5) the economic policy uncertainty index. These five variables capture actions of major economic agents as well as represent major sectors. In addition, these variables also shed light on economic agents' expectations about the near-term economic outlook.

The S&P 500 index is a favorite measure to capture investor emotions. For example, if financial sector participants are optimistic about the economic outlook then, usually, the S&P 500 index

³ For detail about the Dynamic Factor Modeling Approach, please see the Appendix of this report.

⁴ Benhabib, Jess and Mark Spiegel. (2017). "Sentiments and Economic Activity: Evidence from U.S. States", FRB San Francisco Working Paper series, 2016-19. Princeton University Press. <http://www.frbsf.org/economic-research/files/wp2016-19.pdf>

A multiplier effect boosts the economy but may not change the behavior of economic agents, while shifts in animal spirits may do both.

In our opinion, an index consisting of multiple variables representing multiple sectors of the economy is ideal to measure animal spirits.

moves upward, all else equal (Figure 2). On the other hand, the S&P 500 index typically trends downward during recessions. As mentioned earlier, private consumption is the largest component of GDP and thereby, we include the consumer confidence index in the model to capture consumers' sentiments (Figure 5).

Figure 5

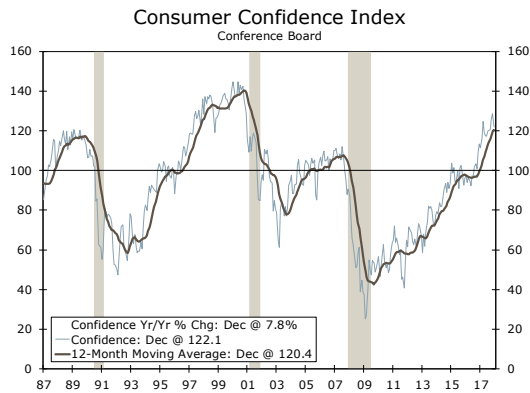
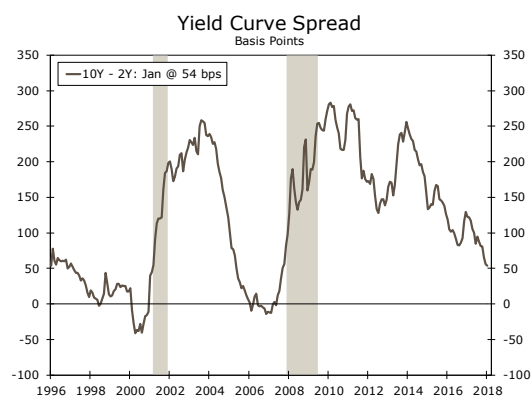


Figure 6



Source: Bloomberg LP, The Conference Board and Wells Fargo Securities

The spread between 10-year Treasury yields and the fed funds rate (the yield spread) is included in the index to represent credit markets (Figure 6). Furthermore, the yield spread is widely considered a forward-looking indicator, as the yield spread is a component of the index of leading economic indicators (LEI). In addition, the inverted yield curve is often considered a recession predictor as the yield curve has inverted before each of the past seven recessions. Therefore, investors may be uneasy in the case of an inverted yield spread. The fourth component of the ASI is the VIX index (the CBOE volatility index), which serves as a reliable measure of investor sentiment and financial market volatility (Figure 7).

Economic policies are another key driver of economic activities and affect economic agents' sentiments. Thus, we utilized the economic policy uncertainty index created by Baker, Bloom and Davis to measure movements in policy related to economic uncertainty (Figure 8).⁵

Figure 7

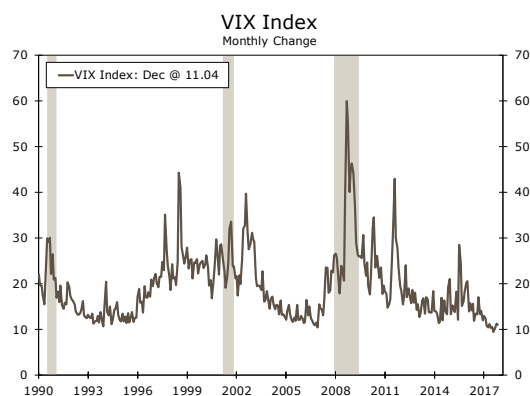
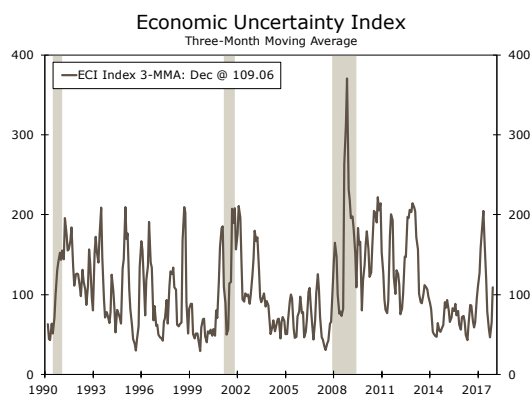


Figure 8



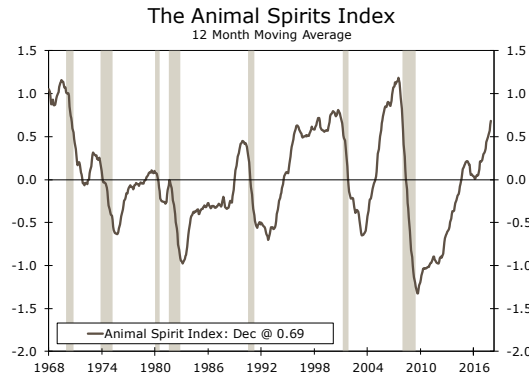
Source: Baker, Bloom & Davis, Bloomberg LP and Wells Fargo Securities

An ASI index value above zero, or positive animal spirits, is an indication of optimism (consumers may increase discretionary spending, for example), while a value below zero, or negative animal spirits suggests pessimism (consumers may put discretionary spending on hold, for instance). It is

⁵ For more detail about methodology and application of the economic policy uncertainty index, see the following website: <http://www.policyuncertainty.com/>

important to note that to show a positive value of the animal spirits index we utilize inverse measures of the VIX and economic policy uncertainty indices (a rise in the VIX and economic policy index represents unfavorable conditions for investors). Therefore, to make it consistent we utilize the level (original) form of the S&P 500 index, the consumer confidence index, and the yield spread along with the inverse of the VIX and the economic policy uncertainty indices in the estimation process.

Figure 9



Source: Wells Fargo Securities

Our animal spirits index goes back to January 1967 and gives us an opportunity to analyze the index's behavior during different business cycles.

Our animal spirits index goes back to January 1967 and gives us an opportunity to analyze the index's behavior during different business cycles. Two observations are quickly visible in the current business cycle: first, the lowest value, of -1.65, was experienced during the Great Recession in October 2008 (Figure 9). Second, the ASI stayed in the negative zone until January 2014, which is consistent with the slow recovery from the Great Recession. In addition, since 2014, the index has shown optimism as the index has remained above the zero line for the majority of the time since February 2014, but not quite to the same extent as the prior two recoveries in 1992-2000 and 2003-2006.

Conclusion: “Not everything that counts can be counted, and not everything that can be counted counts.” - Albert Einstein

With U.S. equity indices soaring and confidence surveys reporting bullish outlooks, it makes sense for us to try to quantify the exuberance in today's environment. While parsing through the literature on measuring animal spirits, it became clear that creating an index consisting of multiple variables, as opposed to a single metric, would more fully capture the whole economy and perhaps provide a more accurate gauge of market participants' emotions. Our index includes information from five variables which are, (1) the S&P 500 index, (2) the Conference Board's consumer confidence index, (3) the yield spread, (4) the VIX index and (5) the economic policy uncertainty index. These five variables capture actions of major economic agents as well as represent major sectors. In addition, these variables shed light on economic agents' expectations about the near-term economic outlook. Furthermore, it would be helpful for decision makers to understand the underlying drivers of animal spirits, thus giving them the ability to directly influence animal spirits.

In coming reports, we will present our estimation of the animal spirits' effect on the economy. In disclosing our findings, we will explain key drivers of our ASI, which may assist the ability of decision makers to influence animal spirits in the future.

Appendix: Dynamic Factor Modeling Approach

The original dynamic factor modeling (DFM) approach dates back to the 1970s (Sargent and Sims (1977) and, during the 1990s, Stock and Watson (1999) improved the original DFM method by utilizing advanced estimation techniques.⁶ The fundamental assumption of the DFM approach is that each economic variable can be decomposed into a common factor component plus an idiosyncratic component. The common component is driven by a few dynamic factors (far less than the number of available economic variables) underlying the whole economy.⁷ Stock and Watson (1999) showed that, with reasonable assumptions, principal component analysis (PCA) can be used to estimate these components consistently. The Federal Reserve Bank of Chicago (Chicago Fed) followed the Stock-Watson approach and produced a national economic activity index for the U.S. economy, which is known the Chicago Fed National Activity Index (CFNAI).⁸ The CFNAI is a weighted average of the 85 economic indicators. The index extracts the first principal component from the 85 variables and then the first principal component is used as a representative of the national economic activity.

We follow the Stock-Watson and the Chicago Fed approaches and extract the first principal component from the 5 variables of the animal spirits and then that component is utilized as a representative of animal spirits.

Here we discuss, briefly, the DFM approach, and for more detail see Stock and Watson (1999). Let X_t be the n -dimensional vector of time series variables and it is observed for $t=1,2,\dots,T$. Additionally, X_t is transformed to be stationary, if not stationary at level, and for notational simplicity we assume also that each series has a mean of zero. The dynamic factor model representation of the X_t with \bar{r} common dynamic factors f_t ,

$$X_t = \rho_i(L) f_t + \varepsilon_{it} \quad (1)$$

For $i=1,2,\dots,N$, where $\varepsilon_{it} = (\varepsilon_{1t}, \varepsilon_{2t}, \dots, \varepsilon_{Nt})$ is a $N \times 1$ idiosyncratic disturbance. $\rho_i(L)$ is a lag polynomial in non-negative powers of L , it is modeled as having finite orders of at most s , so

$$\rho_i(L) = \sum_{j=1}^s \rho_{ij} L^j .$$

The finite lag assumption permits rewriting (1) as,

$$X_t = \Lambda F_t + \varepsilon_t \quad (2)$$

Where $F_t = (f'_t, \dots, f'_{t-s})'$ is an $r \times 1$ vector of common factors, where $r \leq (s + 1) \bar{r}$. The i -th row of the Λ is $(\rho_{i0}, \rho_{i1}, \dots, \rho_{is})$ is a matrix of factor loadings.

⁶ Sargent T.J, and Sims CA. (977). "Business cycle modeling without pretending to have too much *a priori* economic theory", In *New Methods in Business Cycle Research*, Sims CA (ed.). Federal Reserve Bank of Minneapolis: Minneapolis. Stock, James H. and Mark W. Watson. (1999). Forecasting Inflation, *Journal of Monetary Economics*, Vol 44, No. 2 October, pp. 293-335.

⁷ See Stock and Watson (1999) for more detail about the DFM approach.

⁸For background information about the CFNAI, see the Chicago Fed website:
<http://www.chicagofed.org/webpages/publications/cfnai/index.cfm>

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