Financial Conditions and the Business Cycle

Tobias Adrian
IMF

Matthew DeHaven
Brown

Fernando Duarte
Brown

Motivation

Are financial conditions a reflection of the macroeconomy or do they drive fluctuations? "Business-Cycle Anatomy" by Angeletos, Collard, and Dellas (2020) show that business cycles exhibit comovement across a host of macro variables (output, unemployment, consumption, hours worked, investment) at a specific period of 6 to 32 quarters.
We show that the Volatility Financial Conditions Index (VFCI) which measures the price of risk, is also a part of the business cycle. We then show that a shock to financial conditions generates the same dynamics as this empirically identified business cycle shock.

Volatility Financial Conditions Index (VFCI)

The VFCI is introduced in "The Market Price of Risk and Macro-Financial Dynamics" by Adrian, Duarte, and Iyer (WP), and can be interpreted as the *price of risk*. It has superior explanatory power for equity and bond risk premia compared to other financial condition indexes and has robust causal evidence that tightening of the VFCI leads to a decline in macroeconomic conditions and easing of monetary policy.

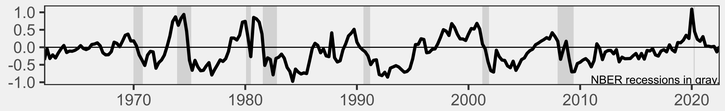

Figure 1: VFCI

The VFCI is consctucted using (1) asset returns and (2) forward consumption growth. We use a horizon of 10 quarters, but results are robust to similar horizons.
All data used in the VARs are measured quarterly and run from 1962 Q1 to 2017 Q1.

Identifying the Business Cycle Shock

VAR Identification Problem: A SVAR(p) model with p lags, for a vector of variables, x_t,

$$B_0 x_t = B_1 x_{t-1} + ... + B_p x_{t-p} + \epsilon_t \tag{1}$$

Empirically, only the following A_i matrices and reduced form residuals, ν_t, are observed,

$$x_t = \underbrace{B_0^{-1} B_1}_{A_1} x_{t-1} + ... + \underbrace{B_0^{-1} B_p}_{A_p} x_{t-p} + \underbrace{B_0^{-1} \epsilon_t}_{\upsilon_t} \tag{2}$$

The matrix, B_0, of contemperaneous impacts linearly maps the reduced form residuals to the structural shocks. The identification problem is determining B_0.

$$\nu_t = B_0^{-1} \epsilon_t \tag{3}$$

Max Forecast Error Variance (FEV) Identification: Pick one variable to target from x_t (i.e. unemployment, $x_t^{(u)}$). Compute the forecast error for target horizon, h,

$$F_{t+h} = x_{t+h}^{(u)} - x_{t+h|t}^{(u)} \tag{4}$$

Choose vector $B_0^{(u)}$ to maximize the variance of F_{t+h},

$$\max_{B_0^{(u)}} \text{Var}\left[F_{t+h}\right] \tag{5}$$

This will identify one shock, up to a change of sign.

$$\epsilon_t^u = B_0^{(u)} \hat{\upsilon}_t \tag{6}$$

For the business cycle shock, calculate the forecast errors, F, over a frequency range $\{\omega^-, \omega^+\}$.

We run the max FEV identification scheme targeting unemployment and then again targeting VFCI. The two identified shocks have remarkably similar dynamics, shown in Figure 2.

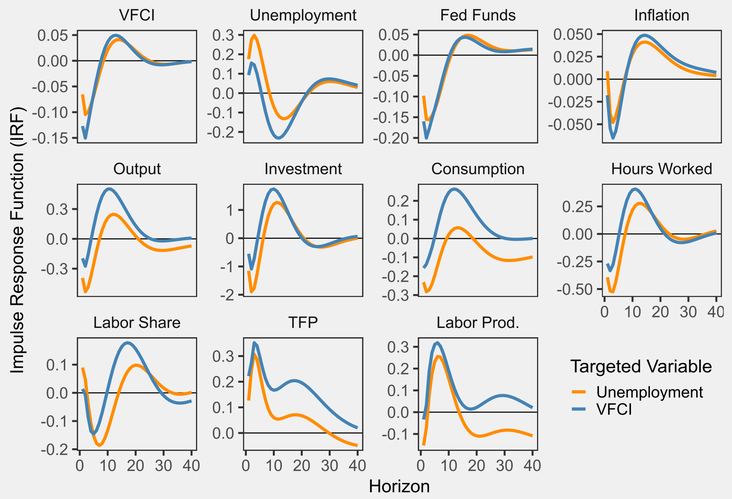

Figure 2: IRFs for Max FEV Shocks Targeting Unemployment or VFCI

We can use the same method for all variables in the VAR, identifying 11 separate shocks. The scatterplot and correlation of each of those max FEV shocks with the unemployment targeted shock is shown in Figure 3. It is clear that VFCI, Fed Funds, output, investment, consumption, and hours worked are all highly correlated with unemployment. The inflation and productivity measures show lower correlations.

Figure 3: Scatterplot of Max FEV VAR Shocks

These previous two figures show that the VFCI is a part of the business cycle. But it could be that financial conditions are simply a reflection of the shifts in the macro economy, not a driver of the cycle.

VFCI Shock Matches the Business Cycle

We will assume a recursive identifcation scheme (i.e. Choleskey), setting VFCI as the first variable in the VAR. This is equivalent to assuming that,

$$B_0^{(vfci)} = \left[b_{0,1}^{(vfci)} \;\; 0 \;\; 0 \;\; ... \;\; 0\right] \tag{7}$$

This assumption is strong, implying that innovations to all other variables in the economy do not have a contemperoneous impact on the VFCI. This can be justified by VFCI being the only included financial variable and thus reacts to any new shock before the slowly moving macro variables.

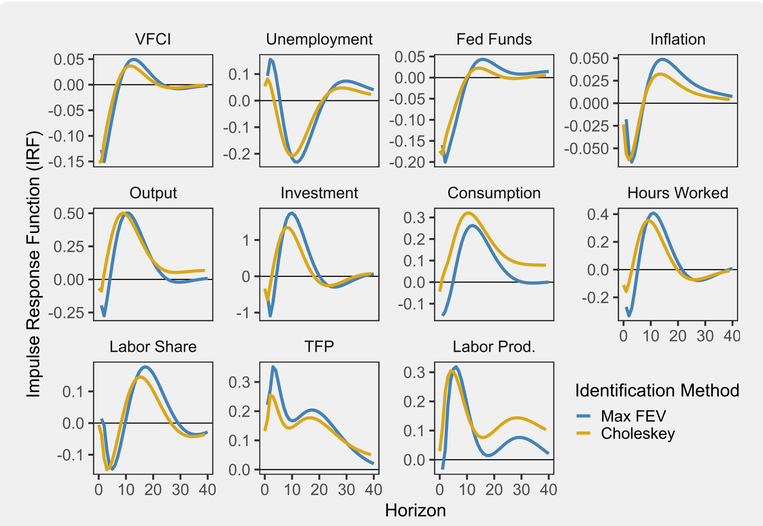

Figure 4: IRFs for VFCI Shock Identified with Max FEV or Choleskey

It is clear in Figure 4, that an innovation to the VFCI causes the same dynamics as the identified business cycle shocks. Given the assumptions for recursive identification, this shows that shocks to VFCI is a driver of the business cycle.

Conclusion

Our work finds that financial conditions, as measured by the VFCI, are a part of business cycle. We have also shown some evidence that changes in the VFCI are driving part of the business cycle.
The implication of this finding is that financial conditions are not just a simple reflection of macroeconomic events, but are either a source of shocks or a common transmission mechanism of shocks from elswhere in the economy. This makes financial conditions extremely relevant for policymakers and an area that should be given more focus in macroeconomic research.