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Poverty Volatility and Macroeconomic Quiescence

By Philip N. Jefferson*

A consistent finding in the poverty literature is the diminution of the impact of the macroeconomy on official poverty rates in the United States since the early 1980s. Up until then, measures of aggregate economic activity (real GDP growth or the unemployment rate) had a more substantial influence on the poverty rate. Most recently, this fact has been documented by Hilary W. Hoynes, Marianne E. Page, and Ann Huff Stevens (2006, HPS hereafter). Kevin Lang (2007) notes that much has changed since the early 1980s with respect to antipoverty policy and labor market factors that affect poverty status. Important changes include the transition from cash to in-kind transfers, the stagnation in real median earnings, rising earnings inequality, and the increase in female-headed households. Nevertheless, after considering several factors that influence poverty, including wage growth, inequality, and female employment, HPS conclude their analysis of poverty trends with the view that explanation of the change in the response of poverty to macroeconomic indicators remains an open issue.

This paper examines whether traction may be gained on this issue by enhancing our understanding of the volatility of poverty rates. Specifically, we examine the volatility of poverty rates over time and across demographic groups. To the extent that poverty rate variability is associated with the risk of poverty incidence, it is shown that certain eras have exposed members of particular demographic groups to more poverty risk than others. Then, we contrast the volatility of poverty rates to that of aggregate economic activity. Margaret M. McConnell and Gabriel Perez-Quiros (2000), among others, present evidence that the volatility of real GDP has been significantly

attenuated since around 1984. This observation raises the issue of whether this quiescence has been transmitted to the volatility of poverty. An elementary statistical framework provides intuition for interpreting poverty volatility relative to GDP volatility.

I. Data and Filtering

The raw data are the official poverty rates for All Persons, Female-Headed Households, and Black Families produced by the Census Bureau. The data for All Persons and Female-Headed Households are available on an annual basis since 1959. The data for Black Families begin in 1967 and are also reported on an annual basis. Philip N. Jefferson (2006) demonstrates that the raw poverty data are nonstationary with trend breaks dating from the late 1960s to the early 1990s. Therefore, in order to avoid known difficulties due to nonstationarity and to sharpen our analysis of the cyclical volatility of poverty, we filter the poverty data using an approximate band-pass filter introduced by Marianne Baxter and Robert G. King (1999). The units of the cyclical components are percentage point deviations from (a possibly stochastic) trend path. Our measure of overall economic activity is real GDP produced by the Bureau of Economic Analysis. After conversion to natural logarithms, the GDP data are passed through the same filter as the poverty rates.

II. Poverty Volatility: Spectra and History

We turn now to the issue of volatility. If the volatility of the poverty rate is associated with the risk of poverty incidence, then it is useful to understand the characteristics of poverty volatility. An intuition is that the more volatile is the poverty rate for any particular demographic group, the greater is the risk of poverty incidence for particular members in that group, *ceteris paribus*. We start by addressing a basic question about poverty volatility: at what frequency is
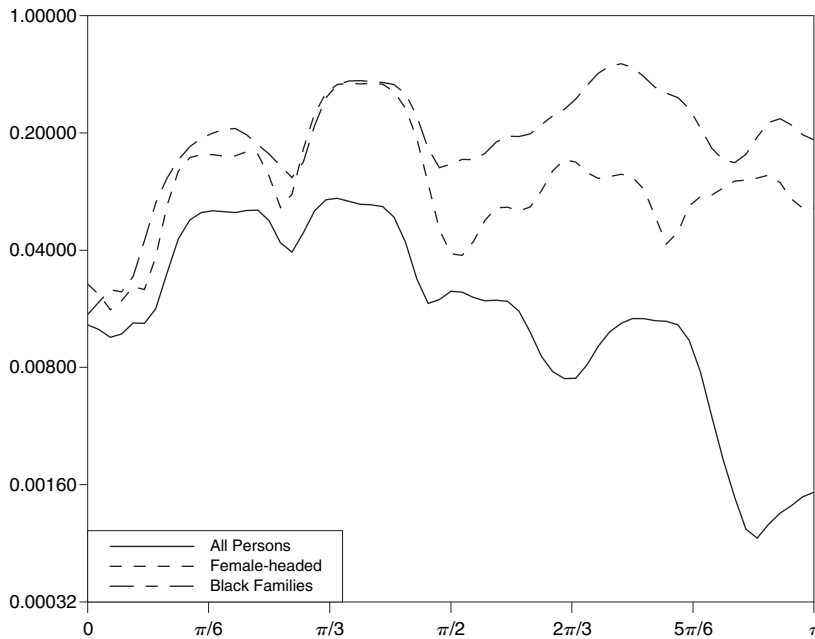
FIGURE 1. POVERTY SPECTRA

the variance of poverty concentrated? Figure 1 illustrates the answer to this question.

It reports the spectrum for each poverty measure where frequency, denoted by ω (measured in radians), is on the horizontal axis and the vertical axis uses a log (base 5) scale. The height of the Black Family poverty spectrum indicates that Black Families experience more poverty volatility at almost all frequencies. Female-Headed Households poverty is just slightly less volatile for frequencies less than 0.5π. There is a prominent hill in the spectra at just less than $\omega = 0.4\pi$. With annual data, each period (denoted by ρ) is one year. Therefore, $\rho = 2\pi/\omega = 2/0.4 = 5$. Thus, a considerable amount of the variance in poverty is due to cycles slightly less than five years in length. This result is consistent with what we should expect, as five years is about the midpoint of what is thought to be the business cycle range. With annual data, the approximate band-pass filter is equivalent to a high-pass filter which attempts to remove only low-frequency (long-run trend) variation. This equivalence is an advantage here because it is for frequencies greater than 0.5π that we see the biggest differences in the composition of variance. In particular, the spectrum for Black Family poverty

has a substantial hill around $\rho = 2.85$ years. This finding suggests that poverty fluctuations around this periodicity also contribute significantly to the variance of Black Family poverty.

The spectra provide a snapshot of volatility across frequencies. It is likely, however, that particular time periods were more volatile than others. For example, Jefferson (forthcoming) documents that the volatility of employment for female high-school dropouts has increased since 1984, even as the economy has become less volatile. The history of poverty volatility is summarized in Table 1. All Persons poverty volatility fell from the 1960s through the 1990s. In contrast, Female-Headed Households and Black Family poverty volatility fell from the 1960s through the 1970s, rose in the 1980s, fell in the 1990s, and rose again in the 2000s. Nevertheless, a striking feature of Table 1 is that, since the 1980s, the volatility for all groups is below its full-sample value

III. Time-Varying Poverty Volatility

Table 1 presents prima facie evidence that poverty volatility has diminished since the 1980s. To examine this issue more closely,

Table 1 – Poverty Standard Deviations by Decade

	All persons	Female-headed	Black families
Full sample (FS)	0.416	0.942	1.087
1960s/FS	1.247	1.329	1.976
1970s/FS	1.133	0.877	0.530
1980s/FS	1.028	1.086	1.348
1990s/FS	0.718	0.733	0.847
2000s/FS	0.816	0.939	0.855

Notes: In row one, cell entries are the standard deviation of cyclical poverty for the given group over the full sample. Units are percentage point deviations from trend. For other rows, cell entries are the ratios of standard deviations for the decade relative to the full sample. 1960s denotes 1959–1969 for All Persons and Female-Headed Households; however, for Black Families, it denotes 1967–1969. 1970s denotes 1970–1979 and analogously for the 1980s and 1990s. 2000s denotes 2000–2006.

Figure 2 shows the poverty volatility record on a yearly basis.

The solid line in each panel is the absolute value of the deviation of the poverty series from its mean. The dashed line (a smoothed measure of volatility) is a two-sided, two-year moving average of the absolute deviations. The figure also allows us to track volatility through specific episodes like recessions and expansions. NBER-dated recessions occurred in 1960–61, 1969–70, 1973–75, 1980, 1981–82, 1990–91, and 2001. Two features of Figure 2 are noteworthy. First, it does not appear that there is a close relationship between poverty volatility and the stage of the business cycle. Spikes in volatility occur or do not occur before, during, and after both recessions and expansions. For example, during the severe recessions of the 1970s, poverty volatility was relatively low for Female-Headed Households and Black Families. Conversely, even during the long expansion of the 1990s, the poverty rate for Black Families was more volatile than during the turbulent 1970s. Second, the smoothed volatility estimates suggest that a transition in the average behavior of poverty volatility for All Persons may have begun in the early to mid-1980s. For Female-Headed Households and Black Families, there is less visual evidence that such a transition in the volatility of their poverty rates occurred at that time.

IV. Quiescence Transmission?

As noted above, there is considerable evidence that the volatility of real GDP has been significantly attenuated since 1984. Has the quiescence of the post-1984 macroeconomy been transmitted to poverty rates? To address this question, we regress $\sigma(t)$, the absolute deviation at time t of cyclical poverty from its sample mean, on a constant, $\sigma(t-1)$, and the dummy variable Quiet = 1 for $t \geq 1984$, zero otherwise. The results are shown in Table 2. Overall (All Persons) poverty volatility shown in column 1 has fallen significantly since 1984. The two-tenths of one percentage point reduction is more than half of the mean (= 0.33) of the dependent variable of the regression. For particular demographic groups, however, a significant reduction in volatility is not detected. The point estimate for the coefficient on Quiet is negative for Female-Headed Households but insignificant. For Black Families, the same coefficient is positive but also insignificant. If macroeconomic volatility is positively related to macroeconomic risk, and poverty volatility is positively related to poverty risk, then the reduction in macroeconomic risk in the post-1984 period appears to correspond with a reduction in poverty risk for demographic groups *other than* Female-Headed Households and Black Families.

The volatility of poverty rates relative to GDP volatility is presented more directly in Table 3. Reading across the rows of the table, all of the poverty rates have become more volatile relative to the macroeconomy across the two sample periods. These shifts in relative volatility lie at the heart of the instability in standard empirical models of the poverty-macroeconomy relationship documented by David M. Cutler and Lawrence F. Katz (1991) and Rebecca M. Blank (1993) and HPS.
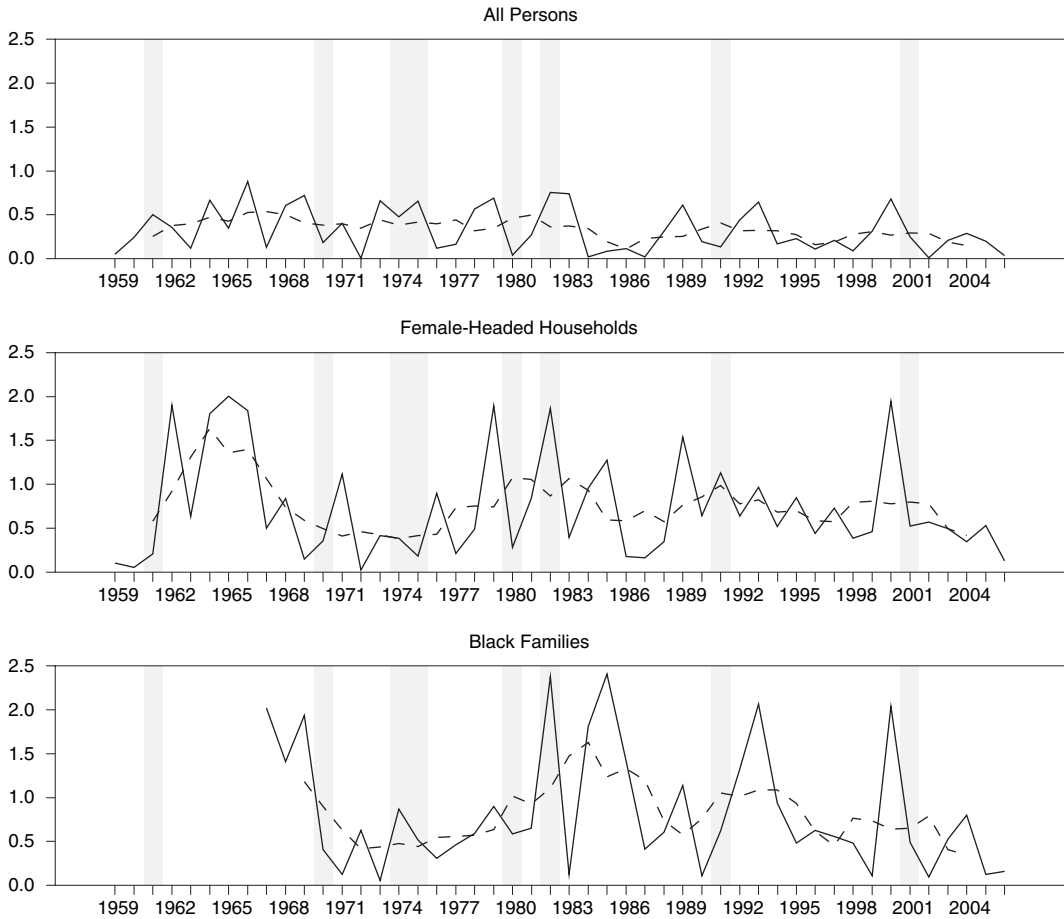
FIGURE 2. STANDARD DEVIATIONS WITH NBER-DATED RECESSIONS

Some intuition for interpreting the poverty variance-to-GDP variance ratios and the issue of quiescence transmission may be gained by considering a stylized statistical framework. Suppose that the cyclical poverty rate, p_{it}, for demographic group i depends on cyclical GDP, y_t, and a group specific shock, η_{it}, according to

$$(1) \qquad p_{it} = -\beta y_t + \eta_{it};$$

$$(2) \qquad \eta_{it} = -\theta_i y_t + \varepsilon_{it},$$

where $\beta > 0$ and $\theta_i \geq 0$. The specification in equation (1) is consistent with poverty being countercyclical as reported in the poverty literature. The specification in equation (2) is meant to capture the idea that there may be some correlation between macroeconomic performance and the shock experienced by the group. Just how specific the shock is to group i is unknown. An inference can be drawn, however, given the observation of y_t. Therefore, the group-specific shock has two components. The first component, $-\theta_i y_t$, is the projection of η_{it} onto y_t. Thus, θ_i is the associated group specific least squares projection coefficient. The second component, $\varepsilon_{it} \sim (0, \sigma_\varepsilon^2)$, is the forecast error associated with the projection of η_{it} onto y_t. By construction, ε_{it} is orthogonal to y_t. Substituting equation (2) into equation (1) and then calculating the variance of p_{it} yields

$$(3) \qquad \sigma_p^2 = (\beta + \theta_i)^2 \sigma_y^2 + \sigma_\varepsilon^2,$$

TABLE 2—IMPACT OF QUIESCENT EPOCH ON POVERTY VOLATILITY

	All persons	Female-headed	Black families
$\sigma(t-1)$	−0.093	0.062	0.157
	(0.144)	(0.150)	(0.160)
Quiet	−0.208*	−0.112	0.099
	(0.071)	(0.173)	(0.219)
Adjusted-R^2	0.125	−0.030	−0.022

Notes: Dependent variable is $\sigma(t)$, the absolute deviation at time t of cyclical poverty from its sample mean. A constant (not reported) is included in each regression. Quiet = 1 for $t \geq$ 1984, zero otherwise. Standard errors are in parentheses. * denotes significance at the 5 percent level.

TABLE 3—POVERTY VOLATILITY RELATIVE TO GDP VOLATILITY

	1959–1983	1984–2006
GDP	1.664	0.834
All persons/GDP	2.189	2.829
Female-headed/GDP	1.783	3.221
Black families/GDP	2.157	4.911

Notes: In row one, cell entries are the standard deviation of cyclical GDP for the given time period. Units are percent deviation from trend. The units of the poverty standard deviations were converted into percent deviation from trend also. Thus, for the other rows, cell entries are the ratio of standard deviations which is a unitless number. For Black Families, the range of the earlier period is 1967–1983.

where the dependence of σ_p^2 and σ_ε^2 on group i is suppressed for ease of exposition. It follows from equation (3) that

$$(4) \qquad \partial\sigma_p^2/\partial\sigma_y^2 = (\beta + \theta_i)^2 > 0$$

and

$$(5) \qquad \sigma_p^2/\sigma_y^2 = (\beta + \theta_i)^2 + \sigma_\varepsilon^2/\sigma_y^2.$$

Equation (4) suggests that, *ceteris paribus,* a reduction in macroeconomic volatility should be transmitted to poverty in the form of less volatility in the poverty rate. The rate of transmission depends on β, the general effect of economic activity on poverty, and θ_i, the specific effect, if any, of economic activity on poverty for group i. Equation (5) suggests that two factors determine the poverty volatility-to-GDP volatility ratio: (a) the rate of volatility transmission, $\partial\sigma_p^2/\partial\sigma_y^2$, and (b) the noise-to-signal ratio, $\sigma_\varepsilon^2/\sigma_y^2$.

The prediction in equation (4) is consistent with the evidence in Table 2 for All Persons. (Note that since All Persons poverty is an aggregate of all demographic groups, it is perhaps more natural to set $\theta_i = 0$ for this category.) However,

there was little, if any, transmission of quiescence for Female-Headed Households and Black Families; that is, $\partial\sigma_p^2/\partial\sigma_y^2 \approx 0$. Further, Table 3 indicates that σ_p^2/σ_y^2 is higher since 1984 for Female-Headed Households and Black Families. Therefore, it follows from equation (5) that the noise-to-signal ratio must have increased since 1984. Thus, for Female-Headed Households and Black Families, there is a sense in which their lives have become noisier: idiosyncratic shocks, ε_{it}, have come to play a relatively more important role in the determination of poverty status in the period of macroeconomic quiescence.

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