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Income volatility and mobility: A conceptual exploration of two frameworks☆

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ABSTRACT

This paper explores two frameworks for measuring income volatility using data from the Panel Study of Income Dynamics. The permanent income framework measures volatility as the standard deviation of income change in a study period, which classifies all change in income as volatile. The income trend framework measures volatility as the standard deviation of income change from an individual's own income trend line, which distinguishes the amount from the direction of income change. Results from a hierarchical linear model suggest that a large proportion of income volatility is explained by the income trend line. Results from a fixed effects model suggest that the distribution of income volatility by the direction of the trend line is unequal. Declining income is more volatile than rising income.

1. Introduction

A mismatch exists between how changes in income are experienced by individuals and how research often classifies those changes. The primary measure of volatility used in the literature is the standard deviation of income change in a study period (Jenkins, 2011), which classifies all change in income as volatile. For example, stable, upward movements, like those received from an annual raise, are measured as volatility even though most people would consider this rising income, not volatility. This paper relies on an alternative measure of volatility, which distinguishes changes in income that are smooth and directional from those that are volatile (Gangl, 2005). We use the alternative measure of volatility to examine asymmetries in the distribution of volatility to the direction of income change that are important for our understanding of the relationship between income volatility and standard of living.

The difference between the two measures is the result of two distinct concepts of the volatility that exists within intragenerational income mobility. If intragenerational income mobility is the raw difference (if any) an individual receives in income from one time period to another, then volatility is the movement or change in income for that individual within those periods. One measure of volatility is the standard deviation of income change from average or permanent income in a given study period (Gottschalk & Moffitt, 1994). We refer to this as the 'permanent income' framework.

The other measure of volatility decomposes the volatility defined by the permanent income framework into two parts, one that is volatile and another that is smooth and directional (Gangl, 2005). Volatility is then measured as the standard deviation of income change from an individual's own income trend line. While an income trend line is not the same as mobility, it may be used to create a measure of mobility. The difference between the first and last period of income from the estimated trend line within a study period produces a measure of mobility that is almost identical to the measure of mobility produced by the raw difference in income in that same study period. We refer to this as the 'income trend' framework.

Both frameworks have been used to explore the relationship between volatility and inequality across individuals (Gangl, 2005; Gottschalk & Moffitt, 1994). Further, the income trend framework has also been used to examine the cross-national relationship between mobility and inequality (Gangl, 2005). We use the income trend framework to explore the relationship between volatility and income mobility by distinguishing volatility from the direction of income change within individuals that is hidden in the measure of volatility used in the permanent income framework.

Data are from the Panel Study of Income Dynamics (PSID). A hierarchical linear model is used to distinguish income trend from income volatility. Then, a fixed effects model is used to examine the relationship between income volatility and the direction of income change (upward or downward).

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The results suggest three main empirical findings. First, a large proportion of what was previously defined to be income volatility is explained by changes in income that are smooth, not volatile. By itself, the empirical finding is not surprising because the level of volatility is a function of the particular trend line one chooses, by definition. However, distinguishing changes in income that are smooth from those that are volatile is a necessary first step to examining the relationship between volatility and the direction of income change. Second, while volatility has long been understood as a phenomenon that is negatively related to age (Gottschalk & Moffitt, 1994), a large proportion of the negative relationship is explained by the direction of income change. Third, downward changes in income are more volatile than upward changes in income.

The empirical findings contribute to our theoretical understanding of the relationship between income volatility and standard of living. According to economic theory (Friedman, 1957), income volatility are changes in income that do not alter a person's permanent standard of living, often defined by consumption. While there are long standing critiques of this idea (as discussed in Blundell, 1988), the argument is salient if volatility is higher among the young and then declines with age, as previous research has established (Gundersen & Ziliak, 2008). If individuals are able to offset the debts accrued early in life, when their income is both low and volatile, with the wealth accrued later in life, when their income is both higher and more stable, then income volatility may not alter an individuals permanent standard of living. However, if volatility is less related to age and more related downward mobility, as we propose, as well as income, as has been long understood (Bane & Ellwood, 1986), then the results alter and clarify our understanding of the mechanism through which volatility affects standard of living.

2. Background

While income volatility has been a part of social science research since the 1950s (Friedman, 1957), most recent work has focused on its relationship to income inequality. In a series of papers, Gottschalk and Moffitt (1994, 2009), and Moffitt & Gottschalk (2012) sought to explore rising income volatility as one possible component of rising inequality. Without discounting the importance of the relationship between income volatility and inequality at the aggregate-level, it says little about the relationship between volatility and upward and downward movements in income at the individual-level (Western, Bloome, Sosnaud, & Tach, 2012), which is the focus of this paper.

We begin with Friedman (1957), who suggested that only a permanent change in income has an effect on standards of living because short-term changes could be smoothed out by subtracting from or contributing to personal wealth, i.e. borrowing and saving. Drawing from Friedman's initial charge that income change must be decomposed into short- and long-term changes, Gottschalk & Moffitt (1994) sought to explore a new dimension of rising income inequality: rising income volatility. Imagine a simple economy with two individuals, one with average or 'permanent' earnings of $100, and another with $1,000. One individual saw their income rise 10% while the other saw theirs fall by the same percentage in one year. In the next year, the previous trends reversed themselves. Income inequality would rise (or fall) even though changes in the inequality of permanent incomes would be negligible.

Gottschalk & Moffitt (1994) decomposed total income inequality into two parts, distinguishing 'transitory' or short-term changes in income from 'permanent' changes in a study period. As shown in model (1), total inequality in a study period is the variance of income ($\hat{y}_{it}$), which is mathematically the sum of the permanent and transitory components. The permanent component is the variance of average individual earnings in that study period ($\hat{\mu}_i$) and the transitory component is the variance of the residual from the permanent component in that same study period ($\hat{v}_{it}$). We call this the 'permanent income' framework.

$$\overbrace{\mathrm{Var}(\log y_{it})}^{\text{total inequality}} = \overbrace{\mathrm{Var}(\mu_i)}^{\text{permanent}} + \overbrace{\mathrm{Var}(\upsilon_{it})}^{\text{transitory}} \quad (1)$$

Building on the relationship between inequality and volatility, Gangl (2005) sought to explore the relationship between inequality and mobility. Following Gottschalk and Moffitt, income inequality is also decomposed into a permanent and transitory component, as shown in model (2). However, model (2) further decomposes both the permanent and transitory component of income change. The permanent component is decomposed into both a real income growth ($\beta_r T$) and an age-specific growth ($\beta_a T$) in a study period. The transitory component is decomposed into a person-specific income trend ($\beta_i T$) and a deviation from that trend (υ_{it}), referred to as volatility. We call this the 'income trend' framework.

$$\overbrace{\mathrm{Var}(\log y_{it})}^{\text{total inequality}} = \overbrace{\mathrm{Var}(y_{0i}) + \mathrm{Var}(\beta_r t) + \mathrm{Var}(\beta_a t)}^{\text{permanent}} + \overbrace{\underbrace{\mathrm{Var}(\beta_i t)}_{\text{trend}} + \underbrace{\mathrm{Var}(\upsilon_{it})}_{\text{volatility}}}^{\text{transitory}} \quad (2)$$

According to Jenkins (2011), the measure proposed by Gottschalk & Moffitt (1994) is the prevailing one used in the literature, but critics do exist. Dynan, Elmendorf, & Sichel (2012) note that the use of variance to measure volatility is hard to interpret, even if the trend is clear. Shin & Solon (2011) note that the decomposition measures may incorrectly call what ought to be permanent change, transitory change and visa versa. Gottschalk & Moffitt (2009) themselves acknowledged as much by noting that the method does not correctly account for some of the subtle, random changes in earnings that are processes of the permanent component, not the random component. However, similar conclusions are derived using more sophisticated measures that overcome these problems, but at the cost of making stronger assumptions about the shape of income change (Moffitt & Gottschalk, 2012). Even though there is broad consensus that volatility is rising over time, alternative measures do differ in the specific level of volatility as well as the exact periods in which volatility is rising or stagnating (Western et al., 2012).

Following Nichols & Rehm (2014), we argue that there is an additional problem with the prevailing measure of income volatility. The measure estimates the amount of income change, but it does not distinguish between the amount and direction of income change within individuals. According to Nichols and Rehm, "Most approaches, except Gangl (2005) specify log income as evolving linearly with time or age *across* people, rather than *within* person [emphasis in original]…" In other words, most research examining the relationship between income inequality and volatility is based on the idea that some proportion of income inequality may be explained by short-term, transitory changes in income across persons, as opposed to long-term, directional trends within persons. The analysis presented here is built on that foundation, but examines the relationship between short- and long-term changes in income within persons, by itself.

Research on income dynamics has examined income change or directions within persons or families, but not the relationship between the two. Regarding income change, Cheng (2014) analyzed wages over time among a cohort of individuals by including a component to capture random variability in wage attainment, but the goal was to explain intracohort inequality, not volatility. DiPrete & McManus (2000) analyzed two-year change in earnings (positive or negative), but the focus was to estimate the impact of various 'trigger events' on income change, not the relationship between the direction of income change and volatility.

Regarding income direction, Hacker (2006) analyzed large income losses in a two-year period of time, but concentrates on the trends and the distribution across groups. The work of Winship (2011) raises important methodological critiques to measuring volatility as large income losses, especially the role of 0 and imputed earnings. One solution is to examine change in earnings, but the results are qualitatively similar (Dynan et al., 2012; Shin & Solon, 2011). Further, Western,