analysis of data on foreclosed properties and the manner in which loan balances were reported by seller/servicers.

In general, however, with the increase over time of the Enterprises' share of the overall mortgage market, the data grow increasingly rich. If necessary, OFHEO could supplement these data with data from the Federal Housing Administration or other sources such as TRW Redi and Mortgage Information Corporation.

If the stress benchmark is wholly or primarily based on Enterprise data, the loan-level data could be aggregated across the two Enterprises in order to determine the worst historical experience. Preliminary analysis suggests that the worst historical experience may be different for the two Enterprises. An alternative would be to determine the worst historical experience for each Enterprise separately and then use a simple or weighted average of default rates.

Question 1: What data and methodology should OFHEO use in its determination of the stress benchmark?

Benchmark Time Period and Region

OFHEO has considered at least two approaches for defining the benchmark time period. It could be defined as the period in which the highest rates of default occurred, that is, an "exposure year" approach; or the period in which the loans with the highest cumulative or lifetime rates of default were originated, which can be termed an "origination year" approach. At the start of the stress period, the Enterprises' books of business will include survivors from many loan origination years. An exposure year benchmark corresponds more closely to the manner in which the Enterprises' mortgage portfolios will experience the risk of credit losses as they move through the ten-year stress period. However, using exposure years may complicate adjustments for differences in LTVs and other factors (see "Relating Stress Period Default Rates to Benchmark Default Rates' below). Using origination years may require some adjustment for differences in mortgage age (see "Mortgage Age" below) since virtually all of the Enterprise mortgages will have been originated prior to the start of the stress period.

Alternative approaches to defining the stress benchmark (exposure year versus origination year) suggest alternative analyses of defaults. An exposure year approach requires the determination of default rates on loans of varying age at risk of failure within a specified period. The resulting time-period specific default rates for loans outstanding at the beginning of the period can be termed "conditional rates." Because default rates vary with the age of a mortgage (see "Mortgage Age" below), OFHEO might define an age schedule of conditional default rates for loans outstanding at the start of the stress benchmark.¹³ For comparison across time periods and regions, synthetic cumulative default rates for the stress benchmark could be derived under a common set of prepayment assumptions. In an origination year approach, either cumulative or conditional default rates could be used.

The Act requires that the benchmark region comprise a contiguous area containing at least five percent of the total United States population. Part or all of states such as Texas or California satisfy this population requirement; however, areas experiencing the highest rates of default may cross over one of these state's boundaries into adjoining states. As appropriate, OFHEO will use a definition of benchmark region that includes more than one state, part of one state, or parts of several states.

Question 2: How should the benchmark time period be defined?

Measurement of Default

Default can be defined in several ways: Defaults can be deemed to occur at the time a borrower ceases making payments, when a loan payment is past due by a contractually specified number of days, on the date of foreclosure, or on the date when losses are recognized. Defaults can be measured on a gross basis or net of any subsequent cures.

Question 3: What are the relative merits of the alternative approaches for the measurement of mortgage defaults?

B. Relating Stress Period Default Rates to Benchmark Default Rates

Default rates during the stress period may differ from the default rates associated with the stress benchmark. This difference may result from differences between the characteristics and composition of an Enterprise's mortgages at the start of the stress period relative to those of the mortgages identified with the stress benchmark. Stress period default rates may also differ from stress benchmark rates as a result of differences in the stress period environment, such as interest rates and inflation. OFHEO must also specify the timing of defaults and losses during the stress period.

The Act requires that OFHEO, in establishing the stress test, take into account appropriate distinctions among types of mortgage products, differences in LTVs, and other factors that OFHEO's Director considers appropriate.¹⁴ Such factors include prepayment activity, mortgage age, and loan size. The Act also requires an adjustment for the effects of general inflation in the highest interest rate environment in the stress test.¹⁵

Loan-to-Value Ratios

The payment of principal and changes in the value of the property securing a mortgage affect LTVs over time. Repayments of loan principal and rising property values lower LTVs, while falling property values raise LTVs. Because LTV is a common measure of borrower equity, and borrower equity is a major factor determining defaults and losses, the stress test must take into account changes in LTVs. If distributions of LTVs during the stress period differ from those for the same types of loans associated with the stress benchmark, defaults and losses during the stress period will likely differ from those of the benchmark.

All loans owned or guaranteed by the Enterprises at the start of the stress period will have been originated prior to that time. Although relatively good estimates of property value are available at the time of loan origination, OFHEO will need to use house price indexes to obtain estimates of the LTVs for mortgages at the start of, and possibly throughout, the stress period.¹⁶ OFHEO

¹³ Age is often a proxy for additional unobserved factors affecting the default probabilities of individual mortgages. Immediately after origination, default is unlikely for all borrowers. Default rates first rise over time as new information about properties and borrowers is revealed. Then as relatively weaker borrowers default, the average rate of default declines. See, for example, the discussion in C. Pestre, P. Richardson, and C. Webster, "The Lehman Brothers Mortgage Default Model and Credit-Adjusted Spread Framework," Mortgage Market Analysis, Lehman Brothers, Fixed Income Research, January 28, 1992. Other influential default studies that have included mortgage age as an explanatory factor include: T. Campbell and J. Dietrich, "The Determinants of Default on Conventional Residential Mortgages," Journal of Finance, 38(5):1569-1581, 1983; D. Cunningham and C. Capone, "The Relative Termination Experience of Adjustable to Fixed-Rate Mortgages," The Journal of Finance, 45(5):1687-1703, 1990; and J.M. Quigley and R. Van Order, "More on the Efficiency of the Market for Single Family Homes: Default," Center for Real Estate and Urban Economics, University of California, Berkeley, 1992.

¹⁴ Section 1361(b)(1) (12 U.S.C. 4611(b)(1)).

¹⁵ Section 1361(a)(2)(E) (12 U.S.C. 4611(a)(2)(E)). ¹⁶ For an origination year benchmark, OFHEO will likely have access to accurate information about the original LTVs for all benchmark loans. On the other hand, to develop an exposure year benchmark, OFHEO will have to estimate LTVs during the benchmark time period for all loans Continued