

**Abstract.** Starting from Milbrodt (1985), the asymptotic behaviour of experiments associated with Poisson sampling, Rejective sampling and its Sampford-Durbin modification is investigated. As superpopulation models so-called  $L^r$ -generated regression parameter families ( $1 \leq r \leq 2$ ) are considered, allowing also the presence of nuisance parameters. Under some assumptions on the first order probabilities of inclusion it can be shown that the sampling experiments converge weakly if the underlying shift parameter families do so (Theorems (3.3) and (4.4)). Moreover, the sequences of sampling experiments are weakly asymptotically equivalent for all three types of sampling plans (Theorem (4.3)). In case of convergence the limit of the sampling experiments is characterized in terms of its Hellinger transforms (Theorem (3.3)) and its Lévy-Khintchine representation (Theorem (3.9)), leading to criteria for the limit to be a pure Gaussian or a pure Poisson experiment respectively (Corollary (3.14)). These results are then applied to the situation of sampling in the presence of random non-response (Example (4.7)), and to establish local asymptotic normality (LAN) under more restrictive conditions (Theorem (5.1) and Corollary (5.4)). Applications also include asymptotic optimality properties of tests based on Horvitz-Thompson-type statistics (Example (5.2)), and LAM-bounds (Theorem (5.5)) and criteria for adaptivity (Corollary (5.6)), when testing or estimating a continuous linear functional in LAN-situations. They especially cover the case of sampling from an unknown symmetric distribution, which has been subject to detailed investigations in the i.i.d. case (Example (5.7)).

## Table of Contents

1.	Introduction: Towards Sampling Experiments	2
2.	Experiments Background	7
3.	Experiments Obtained by Poisson Sampling	10
4.	Experiments Obtained by Rejective Sampling and its Sampford-Durbin-Modification	25
5.	Asymptotic Normality of Experiments Associated with Sampling Plans	32
	References	46

*Abbreviated title:* Experiments Associated with Sampling Plans.

*Key words and phrases:* Poisson sampling, Rejective sampling, Sampford-Durbin sampling, superpopulation models, random non-response,  $L^r$ -generated triangular arrays, nuisance parameters, weak convergence of experiments, local asymptotic normality, LAM-bounds, adaptivity, semiparametric models.

*AMS-classification:* Primary 62D05, Secondary 62F99.