

impl Sample for ZExpFamily<1>

Michael Shoemate

This proof resides in “**contrib**” because it has not completed the vetting process.

Proves soundness of the implementation of **Sample** for **ZExpFamily<1>** in **mod.rs** at commit **f5bb719** (outdated¹).

1 Hoare Triple

Precondition

self represents a valid probability distribution.

Pseudocode

```
1 class ZExpFamily1: # analogous to impl Sample for ZExpFamily<1> in Rust
2     def sample(self, shift):
3         return shift + sample_discrete_laplace(self.scale) #
```

Postcondition

Theorem 1.1. Either returns **Err(e)** independently of the input **shift**, or **Ok(shift + Z)** where **Z** is a sample from the distribution defined by **self**.

Proof. By the precondition, since **self** represents a valid probability distribution, then by the definition of **ZExpFamily**, **self.scale** is non-negative.

Since the preconditions for **are** met (non-negative scale), then we claim the postcondition that the returned value follows a given distribution. This distribution matches that defined by **self**.

By the addition on line **3**, the implementation satisfies the postcondition. □

¹See new changes with `git diff f5bb719..f4b102f rust/src/measurements/noise/mod.rs`